JPRS-UFM-87-001 278073
13 JULY 1987

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JPRS Report

Soviet Union

FOREIGN MILITARY REVIEW

No 11, NOVEMBER 1986

JPRS-UFM-87-001

13 JULY 1987

SOVIET UNION

FOREIGN MILITARY REVIEW

No 11, November 1986

[Except where indicated otherwise in the table of contents the following is a complete translation of the Russian-language monthly journal ZARUBEZHNOYE VOYENNOYE OBOZRENIYE published in Moscow by the Ministry of Defense.]

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PUBLICATION DATA

English title	:	FOREIGN MILITARY REVIEW, No. 11, 1986
Russian Title	:	ZARUBEZHNOYE VOYENNOYE OBOZRENIYE
Author (s)	:	
Editor (s)	:	I.I. Bugrov
Publishing House	:	Voyenizdat
Place of Publication	:	Moscow
Date of Publication	:	November, 1986
Signed to press	:	11 November, 1986
Copies	:	
COPYRIGHT	:	"Zarubezhnoye voyennoye obozreniye," 1986

'NEOGLOBALISM' AND U.S. STATE TERROR IN ACTION

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 3-8

[Article by; Col R. Naymov; "'Neoglobalism' and U.S. State Terror in Action (On American imperialism's attack on Libya)]

[Text] American imperialism, striving to achieve military superiority over the Soviet Union and the other countries of the socialist community and to restore the position it lost in the post-war period, continously builds up its military might in a qualitative and quantitative respect, attempting to influence world events with it. From similar military-political practice, as M. S. Gorbachev pointed out in his response to questions from the Editor-in-Chief of the newspaper RUDE PRAVO, a very serious conclusion suggests itself: the U.S. wants to legalize the arms race, and in essence, this is material and psychological preparation for a world war.

The U.S. opernly claims the "right" to interfere here and there and it ignores, and often even directly tramples on, the interests of other countries and peoples, traditions of international conduct, and active treaties and agreements. In addition, by inflaming local conflicts, the U.S. militarists are attempting to distract the world's attention away from the USSR's important peace initiatives on ending the arms race and strengthening peace throughout the world.

With the arrival of the Republican administration, which unleashed a stage of the arms race on a scale never before seen, one more and more often hears from Washington threats of the use of American armed forces in various regions of the globe in which the course of events is taking a turn objectional to the U.S. Appearing before Congress in February 1986, Secretary of Defense C. Weinberger boastfully announced that the United states was beginning to build its relations "from a position of strength" and, in the long term, "from a position of greater strength."

It should be emphasized that the powerful U.S. propaganda machine, zealously defending the interests of the military-industrial complex, played an important role in assuring the conditions for an upswing in the chauvinistic mood among the population. The bourgeois press plays on the feelings of the citizens, to whom it commends the role of citizen of "America the Great--

sovereign of the globe." Strengthening its military might, the Reagan administration more and more often strives to use the armed forces, hiding any aggression with a stream of falsifications, open distortion and cynical lies, the sources of which are revealed as the CIA, the State Department, the Pentagon, and frequently in the White House itself.

Relying on its military presence in various regions of the world and on its economic power, the United States more and more shamelessly attempts to show other countries which policy they should follow, bribes the opposition, and overthrows or "renews" governments using its air force, warships, and other means. It constantly creates hotbeds of conflict and military danger, heating up the situation first in one, then in another region of the world. The United States openly interferes in the affairs of Lebanon and El Salvador, supports and finances the activities of the counterrevolutionaries, anti-people bands and formations in Nicaragua, Angola, Afghanistan, incites coups de etat in other countries, constantly threatens Syria, and carried out a blatant aggression against Libya.

Washington's reliance on the policies of power and dictates in international relations has, in effect, exacerbated dangerously the situation in various parts of the globe. Confirmation of this is the act of state terrorism, direct armed aggression against the sovereign state of Libya, which those on the banks of the Potomac are trying to depict as "an act of self-defense." In fact, the coldblooded attempt at physically removing a Libyan government objectionable to the U.S., on the night of 14-15 April, 1986, whose commission was preceded by long and careful preparation, is the latest crime of American imperialism.

Even in January 1981, within a few days of Ronald Reagan assuming his post as head of the government, the CIA presented the new president a specially prepared report whose chief conclusion, as announced by the foeign press, was that the independent policy followed by the Libyan leadership was one of the serious and substantive obstacles in the path of practical realization of long-term plans concerning the interests of the United States in the Middle East and North America.

In consideration of the conclusions contained in this document, the Reagan administration undertook its first practical steps at exerting political pressure on Libya, closing the country's diplomatic representation in Washington on May 6, 1981, and calling upon its NATO partners to follow its example. A wicked anti-Libyan campaign was unleashed in the country. Its latest stage began with a provocative show of force near Libya's shores--a U.S. Navy exercise--and reached its peak on August 19, 1981, with the announcement that two Libyan jet fighters were shot down. The next outbreak of anti-Libyan hysteria began at the end of 1981, with the publication in the press of data supposedly held by American intelligence on the Libyan government's infiltration of "specially-trained terrorist hit squads" into the United States, whose main job was "the murder of President Reagan and his aides and advisors." Under the cover of these measures, the White House formulated a directive to the Pentagon, and other federal agencies, on preparing a continuously operating multi-option plan to use American armed forces against Libya in the event that Libyan participation in an attempt on a member of the U.S. government was uncovered. The later course of events allowed many Americans to come to the conclusion that the whole story of "Terrorist hit squads" was concocted from beginning to end by certain circles in the U.S. interested in aggravating the situation.

In October of 1984, Secretary of State Shultz in his report on "Terrorism and the Modern World," called for the elaboration of "an active strategy which goes beyond passive defense" and included use of a broad arsenal of preventive measures, and decisive preemptory and retaliatory actions against states which Washington numbered among "the sponsors of terrorism." The CIA was given orders to prepare special "national anti-terrorist groups" in the countries of the Middle East and carry out a series of "secret operations" with their assistance.

It was announced in the foreign press that, at the height of training these groups, one of the subunits made an effort, on March 8, 1985, without CIA approval to destroy "a person dangerous to the U.S." by installing a powerful explosive device in his car. As a result of this terrorist act, the person against whom the attempt by the CIA mercenaries was made remained unharmed, but passers-by were injured: 80 persons were killed and about 200 wounded. The administration in Washington, trying to "cover its tracks," stopped training the groups, that is, it rejected that method while keeping its previous goals, however. Thus, according to Western press reports, a secret plan to use American armed forces aginst governments objectionable to the U.S. was elaborated in the middle of 1985. It included several options for using U.S. troops in which Libya was seen as the main objective of a strike, and Syria and Iran were the backups. Besides this, the document in question included such measures as CIA "secret operations" for the physical removal of heads of state, instigation of armed conflicts in its neighboring states, options for the joint use of the armed forces of the U.S. and her regional partners against these countries, etc.

The U.S. administration's decision at the end of December 1985, to execute the powerful bombing strike by American Air Force and Navy forces, proposed by Navy Chief of Naval Operations, Adm. Watkins within the framework of the plan to overthrow the Libyan government headed by M. Qadhafi, preceded a sharp aggravation in U.S.-Libyan relations. For this, after an analysis of the situation, they examined the use of either tactical aviation subunits or B-52 strategic bombers from the Air Force or the ship-based aviation of the Navy's SIXTH FLEET. On Jan. 7, 1986 the White House announced the end of practically all economic ties between the U.S. and libya, justifying the move with unproven, and more precisely, concocted accusations of that country's leadership's support of "international terrorism." It is well known that the Reagan administration is trying to include in the concept of "terrorism" both the national liberation struggle and the legal retaliatory reaction of freedom-loving states to the hegemonistic aspirations of American imperialism.

During congressional hearings in February 1986, the administration presented a map of Libya marked with 44 objectives passed off as special schools in which terrorists from various regions of the world supposedly study under the guidance of instructors from countries friendly to Libya. In addition, the

State Department distributed to members of Congress a specially prepared document with the cynical title "Qadhafi's Libya - a Model of Aggression."

Under the conditions of shameless chauvinism and anti-Libyan hysteria, preparations were being made by the U.S. Air Force and Navy for a strike against objectives on the territory of a sovereign state, that is, for the latest act of armed aggression. As stated by one of the pilots on the aircraft carrier SARATOGA, from Jan. 24, 1986, during the course of a series of U.S. Navy maneuvers off the coast of Libya, the SIXTH FLEET's naval aviation crews worked on tactics and methods of combat action applicable to the present mission on a daily basis. While conducting one of these maneuvers in March, American carrier aircraft sank two Libyan boats by using HARPOON anti-ship missiles, thereby provoking the Libyan armed forces into retaliatory actions.

The heat of the anti-Libyan campaign, artifically fanned by the Reagan administration, increased. Direct preparation for a piratical air attack on objectives in Libya was begun. Its goals, targets, timing, and the composition of the forces involved was examined at one of the meetings of the Joint Chiefs of Staff. The decision was made to conduct a simultaneous night attack by U.S. Air Force and Navy aircraft on some blocks in the major cities of Tripoli and Benghazi in order to physically remove the leaders of the Libyan revolution with surprise "pin-point strikes" on the residences of the country's leadership, military objectives and airfields, and to create panic and chaos in the country for the purpose of destabilizing the existing order and, in the final analysis, to bring a pro-Western government to power.

The preparation for the aggressive actions were accompanied in the U.S. by a wicked anti-Libyan campaign whose tone was set by highly-placed functionaries of the American administration. They did not spare the expletives, which shocked even their Western allies.

The operation, control of which was given to the commander of the U.S. SIXTH FLEET Vice Adm. F.Kelso, was given the esoteric name ELDORADO CANYON." An important role in achieving the established goals was allotted to the use of F-111 fighter-bombers based in Great Britain. The foreign press has emphasized that these aircraft, equipped with the PAVE TAKE combined targeting system based on IR and laser devices, are capable of sufficiently effective use of precision guided 200 lb. air bombs with laser guidance at night.

In conjunction with the plan, a relatively major Air Force and Navy grouping was activated in this piratical operation. Besides F-111 jet fighters, carrier-based A-6, A-7, F-14, F/A-18 aircraft, E-2C HAWKEYE AWACS planes, EF-111A and EA-6B PROWLER EW platforms, and KC-10 and KD-135 tankers were involved, that is, up to 150 different types of aircraft in all. Data collection on the targets was performed using the space reconnaissance systems, the forces of the SIXTH FLEET and RC-135 and SR-71 strategic reconnaissance aircraft. In the Mediterranean Sea, near Sicily, two aviation task forces led by the aircraft carriers AMERICA (the flag ship) and CORAL SEA, on board which were up to 170 combat aircraft including almost 80 ground attack planes. An amphibious group, led by the helicopter carrier GUADALCANAL, was nearby. In all there were 36 U.S. Navy ships and boats.

Special attention was devoted to providing secrecy from the moment of direct preparation for the operation up to the very delivery of the criminal air strike on the objectives on Libyan territory. Under the guise of the announced SALTY NATION planned exercises, from the 12th of April, active flights of large groups of F-111 fighter bombers took place at the British air bases of Upper Heyford and Lakenheath. By that time, another 20 air tankers were sent from the continental U.S. to the neighboring airfields of Fairford and Mildenhall, supposedly to support the given exercise by supplementing those already on hand. Gen. Gabriel, U.S. Air Force Chief of Staff, happened "by accident" to be in Great Britain.

In conjunction with the plan developed, on April 14 at 21:13, 28 KC-10 and KC-135 air tankers took off from the airfields in Fairford and Mildenhall (Fig. 2). Within 20 minutes, 24 F-111F fighter bombers from Lakenheath and 5 EF-111A EW platforms from Upper Heyford rose into the air. Considering the requirements for reliability in carrying out the combat mission, the plan of the operation called for a check of the operation of the on-board equipment and the F-111F refueling systems while still in British air space. After the first refueling, six F-111A fighter bombers and two EF-111A EW platforms, held in reserve, returned to their bases. The remaining aircraft of the task force continued their flight in radio silence over the Iberian Atlantic with a bend around the Pyrenees peninsula (without entering the air space of France, Spain, and Portugal) and further over Gibralter and the Mediterranean Sea. Another three refuelings were completed in the air during the flight along a route of almost 4,800 km. Passing the Gulf of Tunis area, the group began its descent to an altitude of 50-60 m and its deployment into a combat formation for accomplishment of established missions by individual elements. In accordance with the operation's plan, this group had to deliver bomb strikes on the residences of the government in Tripoli, the international airport, and the Naval Academy in the port of Sidi-Bilyal (Tripoli).

Airborne and amphibious groups of the SIXTH FLEET by that time had completed a secret move from Sicily into the operational areas. The aircraft carrier AMERICA, with the SIXTH FLEET commander on board, was 100 miles north of Tripoli, and the aircraft carrier CORAL SEA, 300 miles northwest of Benghazi. Observation of the air space in Libyan coastal regions was carried out by carrier-based E-2C AWACS aircraft. EA-6B PROWLER EW aircraft entered into their intended zone of standard patrol.

In accordance with the above drawing, taking off from the carriers were F-14s and F/A-18s for fighter cover, A-7s and F/A-18s for neutralization of PVO radar by fire, as well as a strike force composed of 14 A-6E INTRUDER ground attack aircraft, two of which were forced to return after take-off due to mechanical problems. The force, separated by 150 m, set out for the targets in Benghazi. They were the government's backup residence which, in the American command's estimation, was located in the area, and an air force base.

On April 15, 1986 at 01:45 (local time), that is, at six minutes before the beginning of the action of the strike forces, the EF-111A and EA-6B electronic warfare planes initiated active jamming of Libyan AA radar stations, and the carrier-based A-7E ground attack aircraft and F/A-18 fighters launched 48

SHRIKE and HARM anti-radar missiles at the radio equipment of the anti-aircraft systems covering Tripoli and Benghazi.

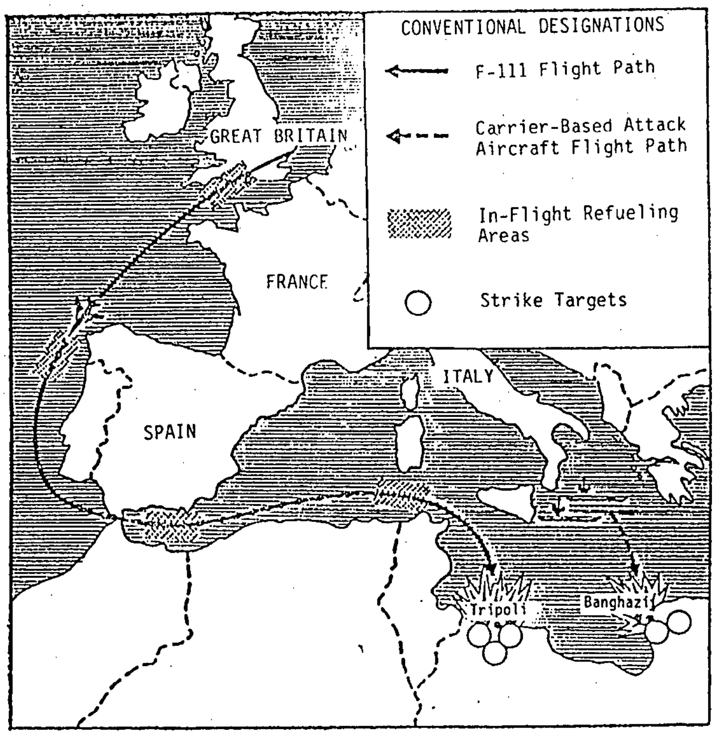

Figure 2. Flight Paths of the U.S. Air Force and Navy Air Strike Groups to the Bombing Targets

The bomb strikes on the objectives illuminated by electric fires in Tripoli (18 F-111F fighter-bombers) and Benghazi (12 A-6E ground attack aircraft) were coordinated by time and delivered practically simultaneously at 2 a.m. During the attack, which lasted 12 minutes, around 150 t of air bombs of 500 to 2,000 lbs were dropped on the sleeping cities. For this, seven F-111F (the main part of the Air Force strike force), each of which was equipped with four guided air bombs, delivered a strike against the two-storey building of the supposed headquarters of the state's leader.

Immediately following the strike, several Western information agencies began to spread false information on the situation in the country. Simultaneously, the Voice of America, located on Egyptian territory, began to broadcast to Libya timely prepared announcements instigating the people of the country to disobey the authorities and to overthrow the legal government of Libya.

The results of the strike for the military-political leadership in the U.S. were, as foreign specialists believe, a little disappointing. Of the five well-designated objectives on the on-board radar screens, only four suffered varying degrees of damage. The strike's main target, consisting of the physical removal of the country's leadership, was not achieved. One F-111F tactical fighter was shot down and another made a landing in route at the air base at Rota, Spain due to some damage which had occurred. The crews of the three F-111Fs and the two F-6E ground attack aircraft left Libyan air space after the criminal attack with full unexpended ammunition loads. In addition, it was explained that when the necessity arose for the aircraft to execute a jink, the deviation of the guided air bombs from the target, in certain cases, was 1500 m, and 700 m for the cluster bombs and conventional air bombs. Instances were noted of failure of air bomb fuses to operate due to the low altitude at the moment the bomb was released.

The Western press is attempting to justify the barbarous bombing of the peaceful Arab population and slough off the blame on lower level individuals. It has been confirmed specifically, that the pilot's not keeping within the parameters of the minitions release and guidance mode led to the destruction of homes and living quarters in Tripoli and Benghazi and the French embassy, as well as to the damaging of the embassies of Iran and Yugoslavia, the residences of the ambassadors of Japan, Austria, and Finland, and casualties among the civilian population. According to data from information agencies, around 50 peaceful residents were killed and over 100 wounded as a result of the barbarous attack.

An evaluation of the strike's results conducted by U.S. military leadership, based on the data from reconnaissance staellites and SR-71 aircraft, required that the Reagan administration substantially change its immediately laudatory statements on the actions of the strike forces' planes, and subsequently in general not to touch upon the effectiveness of the strike in speeches by officials.

Analysis of the course of the preparations for and execution of the air attack on the objectives in Tripoli and Benghazi, as well as the subsequent actions of the administration, led American specialist to conclude that the U.S. military-political leadership, using all the available economic, diplomatic and military means in its arsenal, would continue measures to destabilize the situation in Libya and set up the conditions for the removal of the government of a country objectionable to the United States. In particular, the NEW YORK TIMES emphasized that the Reagan administration sees the April bombing not as an ending but as "the beginning of a lengthy and, possibily, bitter conflict with Libya." In August 1986, UPI reported, for example, that the American administration was reevaluating the possibility of conducting a series of actions against Libya, including a new military strike.

Progressive people world wide sees the aggression, committed by the United States against Libya as a part of a general coordinated course of the U.S. toward exacerbating international tension, conducted within the framework of the so-called "doctrine of neoglobalism" declared by Washington. At the same time, it is believed that the American administration's desire to increase its military might in combination with shameless adventurism, represents the basic threat to peace at the present stage. The condidence of immperialism to act with impunity, joined with the conviction of the appropriateness and even the necessity to use military might to achieve foreign policy goals, brings people of good will to the question: "Who is next: Syria, Nicaragua, the Philippines or some other state not subject to the dictates of the U.S.?"

It is the United States fault that the situation in the world remains troubled. Under these conditions, the Soviet Union, the other socialist countries, and hundreds of millions of supporters of peace are struggling so that it changes for the better. Soviet servicemen draw the correct conclusion from today's complicated international situation. In close combat unity with the servicemen of the socialist community, they vigilantly stand guard over the gains of socialism and, if it is necessary, can respond to the aggressors intrigues in a proper manner.

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U.S. TOPOGRAPHIC MAPS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 13-16

[Article by Col A. Zubenko; "U.S. Topographic Maps"]

[Text] U.S. IMPERIALISM--a citadel for international reaction and militarism, while aspiring to world domination, falsely declares whole continents as zones of its "vital interests." The Pentagon, in plans preparing the armed forces for a war against the socialist countries, primarily the Soviet Union, pays a great deal of attention to the questions of the further perfection of all types of support for staffs and forces for carrying out their combat operations in any area of the world. Supplying staffs, formations and units with topographic maps and other documents is considered a necessary and important task. It has the goal of supplying forces with various maps, geodesic and gravimetric data, photo documents and other materials on a locality, necessary to plan and conduct combat operations, and also for the operational and combat training of staffs and forces in peacetime.

The U.S. Cartographic and Geodetic Service is a complex multi-depatment system. It includes nealy 40 federal institutions, each of which has its own personnel and resources to execute the various geodesic, topographic, and cartographic jobs. However, the primary role in making maps belongs to three departments: the Commerce Department's National Ocean Survey of the National Oceanic and Atmospheric Administration for the study and developing the ocean and atmosphere; the Interior Department's geologic survey, and the Pentagon's map service. The activities of the first two are focused primarily on U.S. territory and territorial waters. The main efforts of the Defense Department, in accordance with American imperialism's strivings, are directed at drawing maps of someone else's territory.

The important organizations for the creation of maps, atlases and other cartographic productions for foreign territory are the Central Intelligence Agency and the Defense Mapping Agency (DMA). The latter's primary mission is to supply the Pentagon, service departments, unified and specified commands with topographic maps, air navigation and nautical charts, geodesic and gravimetric data, and informational materials on a locality.

There are about 250 titles in DMA's geodesic, cartographic and navigational materials, conventionally subdivided into four groups: geographic data, digital topographic maps and other materials in digital form; normal topographic maps, special maps, and routine publications. They are designed to satisfy the requirements not only of the armed forces but also, to a certain extent, those of the merchant marine, NASA, and several other government institutions. These materials are published by air-space, topographic, and hydrographic centers and also the InterAmerican Geodetic Survey which are subordinated to the DMA. The Army Cartographic School (Fort Belvoir, Virginia) trains specialists in preparing the topographic,air navigation and maritime charts for the armed forces.

The Air-Space Center makes the following maps: air navigation at scales from 1:500,000 (tactical-pilotage) to 1:5,000,000 (strategic navigation); [maps] for armed services branches coordination at a scale of 1:250,000; meteorological and others. They are intended for the support of combat operations of the strategic offensive forces, medium-range missile formations, command posts and several other armed forces missile branches. The control center is located in St. Louis, Missouri.

The topographic center uses topographic and special maps, photo- andpicto-maps, relief maps, coordinate catalogues, geodesic points and prepares military-geographical materials necessary to support combat operations in the continental TVDs. The control center is located in Brookmont (near Washington).

The hydrographic center prepares maritime charts of various scales for the navy. Here also they publish bathythermic charts for submarines (including SSBNs), 1:300,000 scale radio navigation charts, 1:5,000-1:25,000 scale navigation charts for transits to ports and harbors, and also Notice To Mariners. Its directorate is located on Suitland (near Washington).

The Inter-American Survey is concerned with mapping the territory of Central and South America. Its directorate is located in Fort Clayton (Panama Canal Zone).

The topographic maps being supplied to staffs and forces are subdivided by scale into large scale (1:25,000-1:50,000), medium scale (1:100,000-1:250,000) and small scale (1:500,000-1:1,000,000) and by intended use: tactical, operational and strategic. The principal (standard) scales for topographic are 1:50,000, 1:250,000, and 1:1,000,000, with supplements at 1:25,000, 1:100,000, and 1:500,000. Troops are also supplied maps of cities, which are subdivided into three types: plan, schematic, and combat maps. DMA publishes topographic maps at scales of 1:25,000, 1:50,000, 1:100,000, 1:250,000, 1:500,000, 1:1,000,000.

TOPGRAPHIC MAPS AT A SCALE OF 1:25,000 (dimensions of the sheet divisions 7.5 x 7.5 minutes of arc) are published as Mercator projections in the 1927 North American system of coordinates [1927 North American Datum]. The height of the ocean [mean sea-level] in 1929, obtained as a result of adjusting the readings of 28 tide measuring stations installed along the U.S. shoreline, is taken as the reference height. The pages have the names of the main geographic objects and the conventional nomenclature. The page with the 1:100,000 scale serves as the basis for the sheet divisions and nomenclature (Fig. 1). The conventional nomenclature is for page 1559 ISE. It is comprised of the nomenclature of a page of a 1:100,000-scale map (1559); the designation of the page with a map scale of 1:50,000 (I), and a compass point (SE, shaded in crosshatch), which designates a given page. Contour lines, depending on the character of the terrain's profile, are placed on the pages every 5, 10, 20 and 25 feet (1 foot equals 30.48 cm).

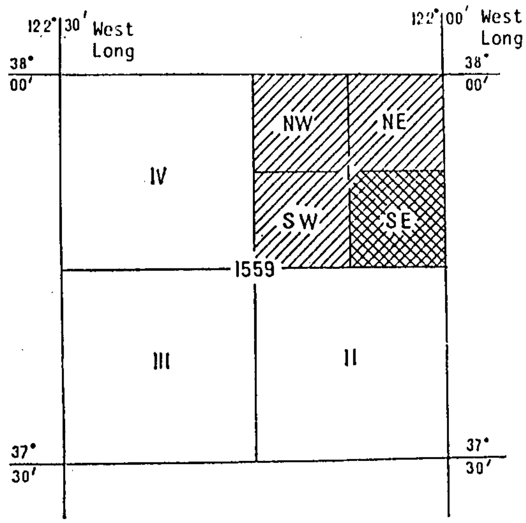

Figure 1. Layout of Page Subdivisions of the 1:100,000-Scale Maps

The UTM (4-cm interval between lines) is marked on the chart. Additionally, the grid for the adjoining UTM zone and also the old military grid of the polyconical projection are shown as extending beyond the boundary line. All these grids, the areas extending beyond them, the numbering and an explanation of them are given in various colors: the primary zone, black; adjacent, blue; and the old military grid, brown. Five colors are used on a map.

The 1:25,000-scale map, in foreign specialists' opinion, is the U.S.'s most up-to-date topographic map and by its accuracy and degree of detail, meets all demands. It is covered with numerous explanations outside the borders (Fig. 2).

TOPOGRAPHIC MAPS AT A SCALE OF 1:50,000, are published as Mercator projections in the 1927 system of North American coordinates. Heights are calculated from the 1929 mean sea level. Page dimensions are 15 x 15 minutes of arc. The pages have the names of the principal geographic objects and conventional nomenclature (for example, page 1559 I), which is made up of the nomenclature of page (1559) of the 1:100,000-scale map and the symbol (I) of the 1:50,000-scale map (on the layout of the division of a page of the 1:100,000-scale map, the page of map 1559 I is hatched with oblique lines). Depending on the character of the terrain (flat, hilly or mountainous), heights of contour intervals are indicated at 5, 10, 20, 25, 40, 50 and 100 feet. The map is in five colors. In content and style, it is identical to the 1:25,000-scale map.

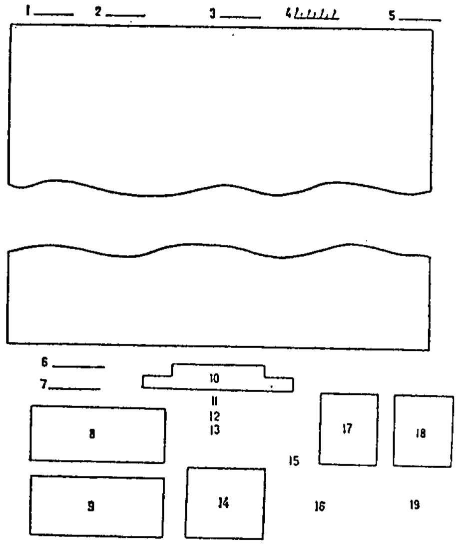

Figure 2. Layout of the Window Presentations of the 1:25,000-Scale Topographic Maps

1. Name of the State and the scale number; 2. Edition number; 3. Page title; 4. Scale of magnetic declination; 5. Nomenclature; 6. Series; 7. Edition number and year published; 8. Official information (cartographic material, years and methods of the geodesic, topographic and cartographic work, names of the organization which produced them); 9. Legend; 10. Numerical and linear scales in English miles, meters, and yards; 11. Contour intervals in feet; 12. Name of the cartographic projection and the coordinate system; 13. Number of the zone and the interval between kilometric grid ticks; 14. Rules for target designation using the UMT grids; 15. Layout of magnetic variation and convergence of meridians; 16. Place and year of publication; 17. Layout of the administrative division; 18. Layout of the arrangement of adjacent pages; 19. Name of the page and state and the geographic index.

The 1:100,000-SCALE TOPOGRAPHIC MAP, size (dimensions) of pages 30 x 30 minutes of arc, is published in the universal Mercator cylindrical cross-section projection in the 1927 North American coordinate system. Four-digit numbers used to designate its pages are a combination of the two-digit numbers of columns and rows. The meridians, drawn every 30 minutes of longitude, serve as boundaries of the columns. The columns are numbered from 01 to 49 in a direction from west to east beginning from 129^0 30' to 105^0 west longitude and from 00 to 77 east from meridian 105^0 west longitude to 66^0 west longitude. The parallels, drawn every 30 minutes of latitude beginning from the parallel $8^030'$ north latitude, serve as the boundaries of the rows. The rows are numbered toward the north from the lowest parallel with numbers 01, 02, 03 etc.

In numbering the pages of the 1:100,000-scale map, a 2-digit number is written first for the column and then the row. Repetition of the column numbers makes it obligatory to supplement the numbering with the name of the state or a large population center, for example, 1559 San Francisco. The contour lines are drawn, depending on the character of the relief, every 20, 50 and 100 feet. Five colors are used on the map.

The 1:250,000-SCALE JOINT OPERATION MAP FOR BRANCHES OF THE ARMED FORCES is published in two versions: topographic--Ground, JOG(G)--for the ground forces; and air navigation--Air, JOG(A)--for the air force.

It is published in two projections: for the zone between 84^0 north latitude and 80^0 south latitude, in Mercator cylindrical cross-section projection and, for the polar regions, in a stereographic projection. The most widely distributed systems are: the 1956 North American (1866 Clarke ellipsoid, initial point, Meades Ranch [Kansas]); 1956 South American (1910 Heyford ellipsoid, La Kanoa); European, (1910 Hayford ellipsoid, Potsdam); Indian (Everest ellipsoid, Kalanpur); Tokyo (1941 Bessel ellipsoid, Tokyo). Information is given in the maps' legend concerning the adoption of a system of geodetic coordinates.

The page of the international ruling of the 1:1,000,000 scale [map] is the basis of the rulings and symbols of the pages of the JOG maps. Each of its pages is divided into 16 parts (between parallels $0\text{-}40^0$, $60\text{-}68^0$ and $76\text{-}80^0$) or into 12 ($40\text{-}60^0$, $68\text{-}76^0$), and for all the North American territories, into 12 parts. The pages are of standard size: 1^0 of latitude and $1^030'$ or 2^0 of longitude. The nomenclature of the map's page looks like NL-15-11 (in the Northern Hemisphere, N is North), SE-4816 (in the Southern, S is South). The nomenclature of the map's page is made up of the nomenclature on a page of the international page division of the 1:1,000,000-scale map (NL-15) and the symbols of the 1:250,000-scale map--(11). In Fig. 3, the page of the 1:250,000-scale map is hatched.

A UTM (Universal Transversale Mercator projection) right-angle coordinate grid is drawn every 4 cm on each of the map's pages, which is used by troops when making mission assignments. For overlapping with the neighboring page the cartographic image is given up to the edge of the page outside the north and east sides of the boundaries. The meridian and parallels are drawn every 15'.

The height of the contour interval in the JOG (G) topographical version is given in meters: 20, 30 and 60, and in the air navigation JOG (A), in feet: 25, 50 and 100. The values for the highest point on the page (its geographic coordinates are given in the legend), the dominating and other heights, are indicated in print of various sizes. The map is printed in eight colors. Standard symbols employed on the map are approved by the U.S. Defense Department's Cartographic Service. Population points are classified according to the size of the area and the importance in the administrative division or by the number of people. They are designated by print size which is used to assign relative values. Great attention is being paid to hydrography, especially in representing the coastline. On the map, the contour of the ocean floor is shown by isobaths on the scale of: 5, 10, 20, 50, and 100 fathoms (1 fathom = 1.82 m).

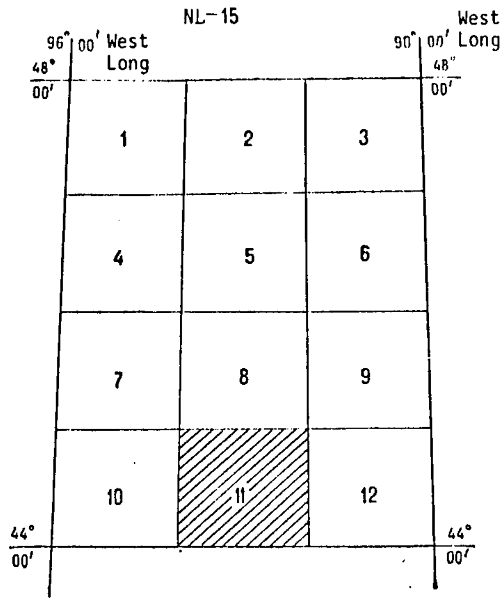

Figure 3. Page layout for 1:250,000-Scale Maps.

Airports, airfields, seaplane stations, heliports, and vertical obstacles for pilots are invaribly shown on the the JOG(G) and (A) maps, and additionally, there are isogonic lines and the means of radio technical support to pilots, on the JOG (A) maps.

TACTICAL PILOTAGE 1:500,000-SCALE MAPS (TPC) are made in Lambert conformal conic projections between the 0-80^0 parallels north latitude and for the poles, stereographic projections north of 80^0 north latitude. The page divisions of the operational and navigation maps (ONC) with a scale of 1:1,000,000 serve as the basis for page division and nomenclature of the tactical-pilotage maps. A page of the ONC map is divided into four pages for the TPC maps, each of which is designated by a letter of the Latin alphabet: A, B, C, and D. Their nomenclature is given on all the maps, for example, TPC E-1B (TPC is the shortened name of the map; E1 is the nomenclature of the page of the ONC map, and B is the nomenclature of the TPC map).

Meridians and parallels are drawn on the map every 30' and divided into sections equal to 1'. Most of the map's pages have an equiangle UTM grid whose lines are drawn every 10 cm (which corresponds to 50 km on the ground) and divided into sections equal to 2 cm. On map pages printed with the UTM grid, the index G (Grid), which is placed next to the nomenclature, is printed in blue just like the grid lines.

The map for the territory of North America is published with a GEOREF grid (without the UTM grid). The pages without the UTM grid have an index S, which is printed on the map in black.

The profile is represented by horizontal contours, hypsometrical layers of paint and a layer tint system. The primary, supplementary and auxiliary horizontals are drawn correspondingly every 500, 250, and 100 feet. Within the territory's limits, circumscribed by the meridians and parallels (1 x 1^0) on the map's page, violet color underlines as much as possible the heights in thousands of feet, for example 5^7, which corresponds to 5,700 feet. The map is published in eight colors.

The large cities are shown by a generalized contour with the plan configuation preserved. Small cities are represented by a contour preserving the plan or by a 2x 2 mm square. Significance, by size of village or town is shown by a circle and, in the majority of cases, without a name. Magnetic declension and magnetic anomalies are shown on the map by isogonic lines, with an interval of 1^0.

Foreign specialists give the TPC map a high rating: Polychromatic and graphic, it contains a large quantity of air navigation data, including locations of airports and the land-based radio support equipment for managing air space (restricted for flights, notification and warning, combat training and others). Plotted on the map are local objects which create obstacles for flights. Their height is printed under vertical obstacles. High tension lines, for example, are among the obstacles.

The OPERATIONAL/NAVIGATION MAP WITH A 1:1,000,000 SCALE (abbreviated ONC) is comprised of a Lambert conformal conic projection between the parallels 0 and 80^0 north and south latitude and of a stereographic projection north of 80^0 north latitude. The pages are bounded by the parallels, traversing 8^0 of latitude and meridians extending through 16^0 of longitude. Pages between parallels are comprised of zones which are marked with capital letters of the Latin alphabet from A to X, beginning from 83^0 north latitude to the South Pole. The letters I and O are omitted. In the zones, the pages are numbered with Arabic numerals from west to east. In the zones, there is no common numbering from the beginning. In zone F (between 40^0 and 48^0 north latitude) the numbering is from the 13^0 meridian west longitude, and in zone G, from 10^0 west longitude.

The nomenclature of a page of the map includes the designation of the zone and the page number in the zone, for example, ONC-F-8 (F is the zone, and 8 is the page number). The map is printed in ten colors. Population centers are represented just the same as on the 1:500,000-scale (TPC) map. The profile of dry land is depicted by horizonal contours, hypsometric layers of colors and layer tint systems. The main interstitial and supplementary horizontals are drawn correspondingly every 1,000, 500 and 250 feet. The map shows data elements for hydrography and hydrotechnical installations which provide visual orientation: lakes, rivers, canals, reservoirs, dikes, dams, piers, large bridges, and also some industrial objects and ground features; pipelines, mines, pits, oil wells, electric power lines, lighthouses, towers, etc. All state borders are depicted by a single common symbol.

A geographic grid (GEOREF) is drawn on the map pages for locating air and ground targets. A diagram of the interchart relationships and the rules for determining coordinates is given outside the southern border of the page. Air navigation targets are given on the map in the same symbols as on the tactical-pilotage 1:500,000-scale chart and printed in violet.

In addition to the nomenclature, on the pages of the maps being published by the DMA topographic center, there is a letter and a 3-digit number which indicate the series. A lettering index signifies a specific country or group of countries (for example, K is the Near East, L is the Far East and Southeast Asia, M is Western Europe, V is the U.S.). The first number after the letter indicates the map's scale (4 is 1:500,000; 5, 1:250,000; 6, 1:100,000; 7, 1:50,000; 8, 1:25,000). The last two digits in the series serve to pinpoint the territory. For example, on the series V782 map, V indicates U.S. territory; the 7, a scale of 1:50,000; the 8, a group of southern states and the 2, the state of Texas.

In addition to topographic maps, DMA makes a large number of specialized maps, photographic maps, and photo documents, prepares reference geodesic and gravimetric data, and also military-geographic materials necessary for a topographic/geodesic support system for weapons and combat operations of forces in the various TVDs.

In connection with the sharp increase in requirements for cartographic production and the introduction of automated means for troop control, topographic maps in digital form, have now been produced and are being used on a wide scale.

9355
CSO: 1801/91

U.S. ARMY COMBAT SUPPORT PRINCIPLES

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 17-20

[Article by Lt Gen L. Sorochenko; "U.S. Army Combat Support Principles"]

[Text] Militaristic circles and the military leadership of the U.S., in pursuit of great-power, hegemonistic goals, are conducting a major effort to increase combat strength. In these aggressive plans for the preparation for unleashing wars against the Soviet Union and other socialist states, an important place is given to increasing the combat potential of the Army by equipping it with modern weapons and equipment, discovering effective ways to use them, and developing perfected forms of combat and rear support.

American military specialists note that, at the present time the Army has become fully mechanized and is equipped with a large amount of technical equipment, aircraft, and automated command and control systems. This has led to changes in tactics and operational art. The new Airland Battle concept has become, in their opinion, fully realizable. However, its realization will depend on many factors, among which is support of all types of material, from weapons and equipment, ammunition and fuel, to clothing and personal equipment.

The importance of such support generally has been accepted both in the past and present. But in modern combat, in Western specialists' opinion, it assumes a much greater significance, since now ground forces have higher demands for mobility, maneuverability, precision, and coordination with air forces, increasing the depth of their strikes. The course of battle directly depends on how fully and timely support will be delivered for all necessities, how soon the wounded and sick will be returned to ranks, and on the repair of damaged equipment and weapons.

All of this, the American leaders believe, is the job of support troops. Experience of past wars confirms that there are no spare battlions, tanks, and artillery to fill these needs. Therefore, special attention must be paid to effective use of available resources, which, to a decisive degree, demands perfection of accepted principles of support and skill in determining the most important of them in given situations.

As reported in the foreign press, development of principles of support is based on the laws of warfare and general provisions of military art. They are important, not only for understanding the functioning of support of modern operations, but also permit a glimpse of the future, to note new tendencies, and to develop short and longer perspectives. Knowledge and deep understanding of the contents of the principles adopted by an adversary make it possible to predict his actions in wartime and substantially prevent their realization in practice.

None of the principles of support should be employed in isolation or be viewed as hard and fast, in the opinion of foreign authors. Each of them contains a basic idea but allows much room for interpretation in given situations. The basis of the principles is the direct or indirect determination of the echelon of support which is responsible for carrying out the support. The majority of them contain recommendations directed at attempting to achieve maximum effectiveness under severely limited expenditures of forces and rear resources.

Having limited ourselves by the introduction above to the opinion of foreign authors on the importance of combat service support, let us examine to which they impart form and in which place content. There are a number of bases for this. First, in recent times, in the Western military press, these principles have been widely discussed, and several of them have been imparted new meaning and content. Second, the goals of support are defined, as well as the main tasks and the order of coordination among the service support units and their subsystems. Third, a detailed examination permits discovering certain information about the basis for the organization of service support in the armies of both the U. S. and NATO.

In recent years many foreign specialists have tried to formulate the general principles of combat service support in wartime; however, under the most favorable conditions. As noted, the most serious attempt to do this was made by U. S. military researchers, in particular James Houston (1). He formed 14 principles which could become fundamentals in the development of relevant documents on combat service support.

During the recent debates they were accorded by many specialists as being contemporary. Studied, was not only the experience from Korea, to which the analysis of Houston's book is dedicated, but also from Viet Nam and other local wars and conflicts unleashed in the last three decades by the U. S. warmongers and their allies.

Articles have appeared in the American press which noted that the Houston's propositions on principles of support may be accepted as fundamentals. It has also been emphasized that several of them must correspond to modern demands for conducting military operations. As a result of the research conducted, American military specialists have accepted nine basic principles of combat service support (2).

MISSION means the goals, design, and the expected and final results. The principal idea in this principle is that the support is abliged to contribute to realizing potential combat capabilities, fire and striking power of the forces under any conditions, to cooperate with them in achieving tactical, operational and strategic goals. It is considered fundamental and comes from the axiom: troops without support cannot realize their combat potential. This principal suggests the necessity to give support realistic goals for troop support in terms of time and quantitiy. This, in the opinion of specialists, should be determined by the possibilities of achieving various types of economies in supply as well as transport, evacuation, and other capabilities of forces, support organizations, and theater support groups.

This principle envisions the necessity for careful formulation of missions by commanders and firm knowledge of the consequences for each subordinate support unit, as well as the expected final results of their activities in supporting combat forces.

Commanders, chiefs of staff, and support at all levels, having received a mission, should, in the shortest period of time, determine the potential and capabilities of accomplishing it, and make a decision on assignment of the necessary forces, equipment, and resources. If the missions cannot be accomplished fully in the available time, then the support commander must immediately present to the commander and senior support commander his suggestion on the priority of fulfilling it or request additional forces and means.

To prevent the possibility of receiving unrealistic missions, the combat service support leader should inform the commander about the activities of his forces and resources, their actual capabilities for supporting combat operations, and about the requirement for assistance from senior support organizations.

REAR TO FRONT In accordance with this principle higher organizations are responsible for providing materiel to consumers; the commander and support commander should be free to the maxiumum extent from concern about provision of materiel; support forces are obliged to follow supported forces, materiel should be delivered to the lowest units without intermediate points, continuous control over the provision of materiel to consumers is necessary.

Since one of the fundamental factors limiting the support forces is time, all leaders must struggle to win it. The distance for the delivery of support, in Western specialists' opinion, on average remains unchanged. Therefore, time may be won by increasing the speed of cargo from higher to lower, from rear to front, by holding to a minimum the number of intermediate points, and reducing the supply lines by improving the technological operation. Army leaders hold the opinion that the mobility of support forces must be the same as that of the supported forces, or even higher. Support on the move and from short halts is considered most desirable.

ADEQUACY This principle combines the following basic propositions: quantitative correspondence of the calculated requirements for amount, volume, and numbers of support forces and means with the battle (operation) and actual provision of them; agreement in time between the concentration and stockpiling of materiel with the start of the battle (operation); ordering of support priorities to accomplish the most critical missions. The American specialists also consider calculation of materiel requirements, on which the success of the combat operation may depend,to be a part of this principle. At the same time,in their opinion, excess buildups of support forces, stockpiling of more materiel than necessary,interferes with the functioning of support forces, reduces their mobility, increases delivery times;necessitates additional support forces and equipment for materiel handling and security, etc. So, it is reported in the foreign military press that, during the U. S. aggression in Viet Nam there was such a large buildup of stores that it raised requirements for American forces. The consequences of this were the pulling of many forces for securing the stores, bases, communications and other facilities. It is also noted that creation of extraordinary stores requires more sophisticated equipment. From this comes the conclusion that the basic idea of the principle of "adequacy" amounts to the fact that the potential of the support should correspond to the requirements for it and should be neither greater or lesser that than.

FLEXIBILITY is one of the most important principles of support. Its basic premise is readiness of support to fulfill its missions under any circumstances. It suggests an avoidance of extreme dimensions when determining the provision of forces and equipment as well as a display of thoughtful initiative by the organizers and providers of support. "Flexibility" in the opinion of American experts, maybe obtained only if, while making the decision all possible occurances are taken into consideration. This will assist in subsequent correct decision making. This principle prevents the elements of chance and surprise from influencing decisions. It is achieved through the uninterrupted process of improving systems as a whole and modernizing all of their component parts in accordance with changes in demands on them.

MOBILITY is one of the elements of flexibility of combat service support, and comprises high moveability and transportability by reliable equipment (transport, communications, and others), and ability to adapt quickly to any situation.

ECONOMY In discussing this principle, the foreign press emphasizes that in a majority of cases, the support resources will be limited and requests from consumers may be satisfied only partially. As noted, even during combat, it will be necessary to regulate the production of all types of material, excluding those which either the lack of or extreme shortage of is dangerous to the normal functioning of the combat service support system. In all circumstances, when possible, it is necessary to take all measures to prevent incorrect expenditure and the loss of material resources.

CONTINUOUS INFORMATION on the requirements for material resources, their availability, location, distribution, losses, arrival, etc. determines the effectiveness of planning material support, its organization, location and economy.In the American military press, it is reported that all support training will turn out to be in vain if not based on full and reliable information. Reports on the most unfavorable factors in the combat service support system must always be objective. Only such information, in the Army leadership's opinion, can ensure the appropriate support where, when and how it is necessary even if the support system is stretched to its limits.

This principle comprises, on the one hand, the necessity of renewing and improving material, and, one the other, combines military and civilian responsibility for the results of military production. American military specialists believe that the support system developed in peacetime should not undergo significant changes in the period immediately preceeding the start of war. Radical changes are even more unacceptable.

It is emphasized that the combat service support system is complex and attempts to revise it seldom are successful. A number of studies show that to do that there are three approaches: maximum use of automated control systems; development of a system of support optimally suited for wartime; and perfection of peacetime planning for wartime requirements.

UNITY OF COMMAND confirms that command of combat service support is just one of the functions of command of troops and that the general requirements for organizing command of troops fully applies to the command of support. From this it follows that commanders should bear the same responsibility for command of support that they bear for command of battle. To divide responsibility for operational and support matters is unthinkable, and, as noted in the foreign press, they are just different aspects of the same problem on all levels. In this connection it is emphasized that the principle of "unity of command" means that, in accomplishing the overall mission, all elements of the combat service support system operate under the overall command of the commander.

SECURITY requires the accomplishment of a complex of measures to ensure the protection and defense of support facilities from enemy actions.

Judging by reports in the foreign press, these are the contents of the principles recommended by the American leadership for organizing combat service support.

1. James Houston, American historian, author of a number of works on combat service support. --Ed.

2. The contents of which are described below.

9355
CSO: 1801/91

ANTI-TANK MINES

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 20-28

[Article by Col (Reserve) N. Zhukov; "Anti-Tank Mines"]

[Text] In the armies of the capitalist states, and especially in the members of the aggressive NATO bloc, intensive preparation for war against the USSR and other countries of the socialist commonwealth continues, weapons and combat equipment and methods for employing them are constantly improved. The new American Airland Battle concept calls for conducting high degree of maneuver offensive actions while simultaneously striking not just the enemy's first echelon, but also his second echelon, reserves, and fixed facilities located at great depth. Under these conditions, as foreign specialists believe, with the goal of interdicting enemy forces, especially his tank units, an important role is allocated to modern mines, the active and correct use of which can substantially influence the course of a battle.

At the present time even greater signficance, especially in the NATO armies, is attached to the term "land mine warfare." At the same time, foremost attention is given to antitank barriers, which are suggested for wide use in all kinds of combat including the offensive. In foreign specialists' opinion, this is due to a number of factors, the principal ones of which are the following: development of new antitank mines, characterized by high destructive capabilities, little weight, and small dimensions; the possibility of mechanizing placement of mines which substantially lowers labor and time demands; the capability for remote emplacement of tank or mixed mine barriers at distances of from dozens of meters to several hundred kilometers for which ground minelayers, cannon or missile artillery, army aircraft or tactical air forces are used.

Modern antitank mines are classified according to their action against armored targets into anti-track, anti-bottom, and anti-side. Their basic characteristics are shown in the table.

ANTI-TRACK MINES - this is the oldest type (called first generation mines). They are characterized by limited effectiveness since they only operate when directly contacted by tanks running gear and they reduce its mobility by damaging the track and road wheels.

PRINCIPAL TACTICAL-TECHNICAL CHARACTERISTICS OF ANTI-TANK MINES

Model (Country)	Case Material	Weight, kg: Total / Explosive	Dimensions, mm: Diameter / Height	Fuse
ANTI-TRACK				
M15 (U.S.)	Steel	14.3 / 10	330 / 125	Mechanical contact
M56 (U.S.)	Aluminum	3.4 / 1.7	(250 x 120)* / 100	Electronic contact
DM21 (FRG)	Aluminum	10 / 5.6	300 / 130	Mechanical contact
9A1 (Great Britain)	Plastic	11 / 8.4	(1,200 x 100) / 80	Hydraulic contact, electronic contact or influence
ACPM (France)	Plastic	6.3 / 4	(280 x 185) / 105	Mechanical contact
MITRAL (France)	Metal	- / .	(300 x 100) / 100	Electronic contact
SB-81 (Italy)	Plastic	3.2 / 2	232 / 90	Pneumatic
TC/6 (Italy)	Plastic	9.6 / 6	270 / 185	Pneumatic
TC/2.4 (Italy)	Plastic	3.6 / 2	200 / 110	Pneumatic
Type 63 (Japan)	Plastic	14.5 / 11	305 / 216	Mechanical contact
ANTI-BOTTOM				
M70 and M73	Metal	2.2 / 0.7	127 / 76	Mechanical influence
M75 (U.S.)	Metal	1.7 / 0.7	120 / 66	Mechanical influence
BLU-91B (U.S.)	Metal	2 / 0.7	(140 x 140) / 60	Mechanical influence
M21 (U.S.)	Steel	8.5 / 4.8	230 / 115	Mechanical contact, Electronic influence
PzMi-3 (FRG)	Plastic	7.9 / 3.8	250 / 110	Electronic influence
AT-2 (FRG)	Metal	2 / 0.7	100 / 130	Electronic contact
HPD mod F1 (France)	Plastic	5 / 2	(300 x 200) / 100	Mechanical influence
SB-MV/1 (Italy)	Plastic	5 / 2.6	235 / 100	Mechanical influence
Type 6 (Sweden)	Plastic	7.5 / 3.5	250 / 110	Mechanical influence
PM83 (Austria)	Plastic	7.5 / 4	(280 x 280) / 140	Electronic contact
PM3,000 (Austria)	Plastic	8 / 4	(280 x 280) / 100	Electronic contact

* Length x width, in mm are shown in parentheses.

PRINCIPAL TACTICAL-TECHNICAL CHARACTERISTICS OF ANTI-TANK MINES (Continued)

Model (Country)	Case Material	Weight, kg: Total / Explosive	Dimensions, mm: Diameter / Height	Fuse
		ANTI-SIDE		
M24 (U.S.)	Steel	10.8 / 0.9	88.9 / 460	Electronic contact or IR
XM84 (U.S.)	Metal	16 / 6.5	(300 x 300) / 300	Electronic influence
LAWMINE (Great Britain)	Metal	. / .	720 x 350 / 500	Electronic influence
AJAX (Great Britain)	Metal	. / .	680 x 300 / 450	Electronic influence
PARM-1 (FRG)	Metal	12 / 1.5	600 x 200 / 400	Electronic contact
MAH mod F1 (France)	Steel	12 / 6.5	185 / 270	Electromechanical contact or influence
ATM-6 (Austria)	Steel	13 / 7.2	180 / 320	Electronic influence
SMI22/7C (Austria)	Metal	7 / .	180 / 430	Electronic influence

* length x width, in mm are shown in parentheses.

Development of new mines of this type is meager, principally for developing countries which need cheap and simple-to-operate mines which do not require much training to use and offer maximum safety to the minelayer. New mines are made in plastic cases and do not use induction fuses. Several of them are placed on a site either by hand or mechanically.

Nevertheless, judging by the foreign press, track-breaker mines up to the present are the most common in the armies of practically all of the capitalist countries, since there are still large stores of this type which were made in the 50s and 60s. Some of these mines are laid with a specially developed mechanism and have an improved fuse - a mechanism and electonic non-contact which converts it from a track breaker to an anti-bottom device capable of penetrating any portion of a moving target.

The AMERICAN MINE M56 has a semicylindrical aluminum case with four braking wings which deploy in flight. It has a electronic contact fuse, calculated to function after sustained pressure (in order to counteract the detonating effect of flails) and a self-destruct mechanism. Some mines are equipped with an anti-disturbance device which explodes it when someone attempts to move it.

The mine is a component of the M56 helicopter mine layer, part of the equipment of U.S. Army aviation battalions. When establishing barriers these mines, one to two minutes after falling to the ground, turn to their combat position and after the requisite length of time it self-destructs if it has not encountered a target.

The ENGLISH L9A1 MINE is long, in a plastic case, laid by a trailer minelayer. It can be equipped with a pressure hydro-mechanical contact fuze, an L127A1 mechanical fuze, L128A1 electronic non-contact fuze of a L131A1 untamperable electonic fuze. The first is placed internally and the other two are located on an end.

The FRENCH ACPM MINE is in a plastic case. It is designed to be laid by a chain mine layer and a self-propelled mine layer. The mine has a pressure lid and goes off only upon full closure by a tank track. In the interest of safety, it has arming two stages and automatically arms 15 minutes after being placed in the soil.

The FRENCH MITRAL MINE, in the development stage, will be remotely laid by a ground, missile or air mine laying system. The mine is in a metal triangular sectioned case. It has an electronic contact fuse with a drive in the form of three press buttons, installed in all three edges of the case. The explosive charge is made up of hexogen. Its exploder is equipped with a non-removable element and a self-destruct unit which explodes the weapon following laying and after a given time period which can be set.

The ITALIAN SB-81 MINE, with a plastic case, is laid by helicopter or manually. It is pressure-activated and can be augmented with an electronic anti-removal device and subsequent conversion to a safe condition after a predetermined length of time. The SB-81 is issued to the Italian Army and is produced under license in Spain, also. Such mines are also found in the Argentine Army. Judging by reports in the foreign press, it was used successfully during combat in the Falklands against the English forces, who had not found an effective way of detecting it.

The ITALIAN TC/6 and TC/2.4 MINES are non-metallic, pressure-activated and are laid by hand. The TC MINE WAS developed specifically for sale to other countries and is purchased, especially by Pakistan, which passes it on to the Afganistan bandit groups, who use these munitions mostly for mining roads.

The PAKISTAN P3 Mk 1 MINE, has a plastic case, and is laid by hand. The detonator of this anti-personnel high explosive mine is located under the circular pressure plate. The explosive material is TNT. The mine is activated by pressure from the track of a tank on the pressure plate, which breaks off at the perimeter and activates the detonator. There is no place to install an anti-removal device.

Anti-bottom mines are called second generation mines by foreign specialists. Their main advantage over first generation mines is their significantly greater effectiveness in less weight and volume, which is achieved by using a shaped charge and electronic influence fuze, which activates the munition against any target angle.

The shaped charge has a closed metal hemispherical or conical cavity. Upon exploding, thecavity forms a projectile, which has an initial velocity of about 2,000 m/sec. As the foreign press reports, such a projectile which has substantial kinetic energy and is able to penetrate any modern tank and ignite the fuel and ammunition in the vehicle. As a result of the sharp increase is pressure in the vehicle, the crew is disabled. In this way, as foreign specialists believe, new anti-bottom mines can fully render tanks inoperable. This circumstance allowed them to reach a conclusion as to the advisability of shifting fully to the second generation mines, whose development is now going on intensively. The first models of them have started to reach troop units, first of all in the NATO countries. A significant number are still in development. All of them, according to classifications used in foreign journals, are divided into conventional (mechanical or manual laying) and remote emplacement.

The FASCAM FAMILY OF AMERICAN MINES are for remote emplacement: the M70 and M73 by 153-mm artillery, the M75 by a minelayer, the XM78 from a mobile container, the BLU91/B and its modern variants from aircraft and ground minelayers. A characteristic of this family is the standardization of a number of components, including: the explosive, the case, parts of the fuze and power supply.

The mines have small cylindrical cases with shaped charges (with two lethal sides) and magnetic (electronic) influence fuzes with anti-removal and self-destruct (after one, two or three hours) devices. The fuzes have several stages of arming: first - when the mine leaves its container (layer), next - after the munition hits the ground and settles. After the passage of the designated amount of time, all second generation mines reliably self destruct, which permits their own forces to clear the area or conduct their maneuvers.

Judging by reports in the foreign press, all mines of this family, which have been type classified and put into production, and model M70, M73, M75 and BLU-91/B mines as components of mine laying systems, have started to enter the inventories and are being used.

The WEST GERMAN PzMi-3 MINE is a component of the MiVS mining system. It is a slightly modernized version of the Swedish type 6 mine (FFV028). The Bundeswehr pruchased a large number of type 6 mines in 1985.

The PzMi-3 is laid by a specially developed mine-laying trailer (either in the ground or on the surface) or manually. The construction of the fuze permits recovery of the mine for reuse. After passage of the preset period of time the mine self neutralizes (becomes safe).

The fuze is equipped with an electromagnetic sensor which sets off the explosive upon being crossed by a heavy armored vehicle. Before the explosion there is a small gunpowder detonation which clears the main charge liner and assists the correct formation of the projectile.

The WEST GERMAN AT-2 MINE is the basic engineer munition of the scatter type, designed for remote installation by ground minelayers and missiles. The mine has been type classified, is being produced, and is being issued. It has a metal case with sprung legs which open when the mine lands on the ground, holding it in a vertical position. The AT-2 has an explosively formed projectile (EFP) with an electronic fuze and a contact sensor in the form of a vertical antenna, an anti-removal device and self-destruction. after landing on the ground and stabilizing, the mine arms and activates when its sensor is contacted by a moving vehicle, when the enemy tries to clear it, or after passage of the set amount of time (6-96 hrs). Mines delivered by missiles have braking parachutes with automatic release after the mine lands on the ground.

The ENGLISH BATS MINE is in the early stages of development. It will be a universal mine for use in a number of remote controlled mining systems, including, as reported in the foreign press, ground mine-layers, helicopter and RPV mining systems, 155-mm artillery rounds, and the warhead of ballistic missiles.

BATS will be a part of the American FASCAM family. With a small weight and size, it should have an EFP and an electornic influence fuze with anti-removal and self destruction.

The FRENCH HPD MODEL F2 MINE is an improved version of the HPD model F1, which has been in service since 1969. It has the same dimensions and is designed for installation by the regular French mechanized mine layers. It differs from the older version in its improved design and greater effectiveness. It is produced in two different modules, is hermetically sealed and can be implaced in up to 5 m of water. It has an electromagnetic fuze with anti-removal and self destruction which makes the mine safe at a preprogrammed time.

The French developmental mine is designed for remote installation by 155-mm artillery rounds is now undergoing testing. It is equipped with an EFP, electronic influence fuze with a delayed arming mechanism, anti-removal, and self-destruction. Another mine has a similar design which is designed for installation from the EBG armored engineer vehicle in the French Army. Both mines have protruding legs, by which they are stabilized after landing.

The AUSTRIAN PM83 MINE was developed by the Hirtenberger firm. Inside its plastic sealed case is a shaped charge and a piezoelectric fuze with four pressure sensors located on the corners of the case. One of the pressure sensors may be replaced with a tilt rod. The mine has an additional depression for an electric detonator to explode the mine by wire or radio.

To arm the mine it is necessary to pull the safetywire, turn and extend the arming lever, located on top of the mine. As a result, the electric circuit is closed. When armed the mine may be moved and removed by its own forces. A special switch is placed in its fuzing circuit for this purpose.

The seal of the mine permits emplacement in up to 2 m of water, and its component parts are designed to function in temperatures from 030^{0} to +60C, which guarantees a shelf life of 25 years or more.

The AUSTRIAN PM3000 MINE, made by Dynamit Novel Wien, has the same case, explosive, and electric fuze as the previous model with a tilt rod and four corner pressure sensors. Inside the case is an anchor with which the mine can be secured. This mine may be made safe for removal and reuse. The electric fuzing circuit self-destructs the mine after a set period of time after arming or automatically safes.

Austrian developers have revealed that the PM3000 is characterized by improved explosives and for remote detonation by wire or radio.

Anti-side mines are a comparitively new type of engineer munition, capable of destroying moving armored targets at significantly great ranges (from dozens to hundreds of meters). As revealed in the foreign press, they complement other anti-tank mines or replace them, where emplacement of the latter is difficult or impossible. The most typical situations for using anti-side mines are the following: emplacement along a road (without destroying the road surface), emplacement in windows or on roofs in urban areas, and covering approaches through various barriers and probable penetrations.

Recently, the number of new types of anti-side mines has noticeably increased. Their destructive element may be divided into two main categories: explosively formed projectiles (EFP) and shaped charge anti-tank grenades fired from the mine.

The AMERICAN XM84 MINE is in development at the present time. It consists of a prismatic metal case, attached to a support, has an EFP charge, and an electric non-contact fuze with accoustic and IR sensors. The first detects targets and the second detonates the mine when the target is in its killing zone. It also has an anti-removal device, which detonates the mine if an enemy tries to disarm it, and a self-neutralization device which disarms the mine after passage of the set amount of time.

This new mine is planned to replace the older M24, which uses the standard M28A1 antitank grenade fired from a tube.

The WEST GERMAN PARM-1 MINE is being developed for Bundeswhr engineers. It has a shaped charge warhead, contained in a short guidance tube, which is on a tripod. As all mines of this type, the PARM-1 is emplaced on the ground or attached to a local object. The mine can be aimed through 360^0 and to elevations of from -45 to +90 degrees. The fuze is electronic with a thin light guide (small electro-optical cable), placed across a section of road where enemy movement is expected. When it is broken a rocket is fired into the side of the armored target destroying it. It is reported that the power source is capable of operating the fuzing mechanism for 40 days, after which the mine is automatically safe.

The ENGLISH LAWMINE MINE is designed around the regular handheld LAW-80 anti-tank missile, for which a tripod has been developed to stand it on the ground, and an electronic fuze with an influence sensor. Moving targets are acquired, identified and attacked at distances of up to 100 m. The foreign press notes that the mine is designed for use only against heavy armored vehicles (both tracked and wheeled).

Another English mine, the AJAX, is made similarly. The basic component of this mine is the Swedish AT-4 RPG, mounted on a tripod and armed with a multisensor electric influence fuze. The latter, according to the manufacturer, can be used with any anti-tank missile turning it into an anti-tank mine.

The FRENCH MAN MODEL F1 MINE is the first Western version of this type of munition, and is currently in the armament of the NATO armies. later, it was produced in Great Britain and in several other capitalist countries. The mine has an EFP warhead and an electromechanical fuze with a trip wire, which is laid across an avenue of approach and detonates the mine when it is broken. Recently it was reported that an infrared non-contact fuze has been used.

The AUSTRIAN AT-6 MINE was developed by the Hirtenberger firm. It consists of an explosive charge in a metal case which is swivel mounted on a stand. The angle of aim is adjustable.

Mine initiation is accomplished by wire with a standard detonation generator or any other power source, with an electric switch located on the tank avenue of approach, and scattered together with other mines set to go off only when encountering an armored target. Defeat of armored vehicles is accomplished by an EFP warhead formed from a steel plate upon detonation. It has an initial velocity of 1,800 mps and, according to the Western press, can penetrate armor at a range of several dozen meters.

The mine is emplaced on the ground and, upon detonation, the friendly forces should be under cover and at least 30 m away.

The AUSTRIAN SMI 22/7C MINE was developed by the SMI firm. This munition has a cylindrical metal case with an optical sighting device on the top for pointing it at the target attack point. Below, it is equipped with hinged legs for placing it on the ground or on local objects. The mine may be activated by wire or equipped with an influence electronic fuze with self-neutralization attachment for automatically safing the mine after passage of a predetermined amount of time.

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CSO: 1801/91

FRENCH AIR FORCE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 31-38

[Article byCol P. Ivanov; "The French Air Force"]

[Text] Despite the country's withdrawal from the NATO military organization, France's military-political leadership continues to closely collaborate with this aggressive bloc in many areas. The republic's president, Mitterrand, announced the following in a NATO council session in Paris in June, 1983; "Although it has not belonged to the NATO military organization since 1966, nevertheless, France has certain responsibilities and requirements for the solidarity within the alliance's bounds, and it firmly intends, and I want to state this here directly, to meet the commitments, which the loyalty and complete interest of each alliance member requires." The French Minister of Foreign Affairs, Shason, made this even more clear in his speech at the NATO council's May (1984) session by saying, "France will always remain a faithful NATO ally and no one may doubt this".

According to foreign press reports, the main directions of this collaboration along Air Force lines are: the improvement and support of an operational NATO unified air defense system in Europe; the assignment of national airspace during exercises for military aircraft flights of NATO member countries; the assignment of air passage corridors for American aircraft flights to areas in the Mediterranean Sea and the Near and Far East; the participation of French Air Force units in large joint NATO air force exercises; and the joint development and production of aviation equipment and weapon systems.

The country's air force is a branch of the armed forces. It executes combat operations both independently and in conjunction with the national ground forces and navy, and also with NATO's allied armed forces in the European theater of war and in France's "zone of vital interests." Its combat make-up includes: 18 S-3D medium-range ballistic missile (MRBM) launcher silos, 22 MIRAGE-4A strategic bombers, more than 470 tactical combat aircraft, more that 200 transport aircraft, 114 helicopters and a large number of auxillary aviation aircraft.

There are more that 96,500 men in the air force, including 36,500 ready servicemen and 5,700 women.

MISSIONS, ORGANIZATION AND COMBAT MAKE-UP. As was noted above, the air force plays an important role in the country's armed forces system. The following missions are entrusted to it; the delivery of nuclear missile strikes against enemy targets to operational and strategic depths; the rendering of direct air support to the ground troops and navy in the European theater of war and coastal territories; battlefield interdiction; the organization of air defense of large administrative centers, important industrial regions and troop grouppings; the conduct of aerial reconnaissance and electronic warfare; the airlift of troops, combat equipment and other cargo; the landing and air cover of assualt and "rapid deployment forces."

All air force units and subunits are organized according to their purpose and belong to the following commands; the Strategic Air Command, the Tactical Air Forces (consists of the 1st and 2nd Tactical Air Commands), the Transport Aviation Command, the Communications Command, the EW Command, Logistics Command and the Air Training Command (Fig. 1).

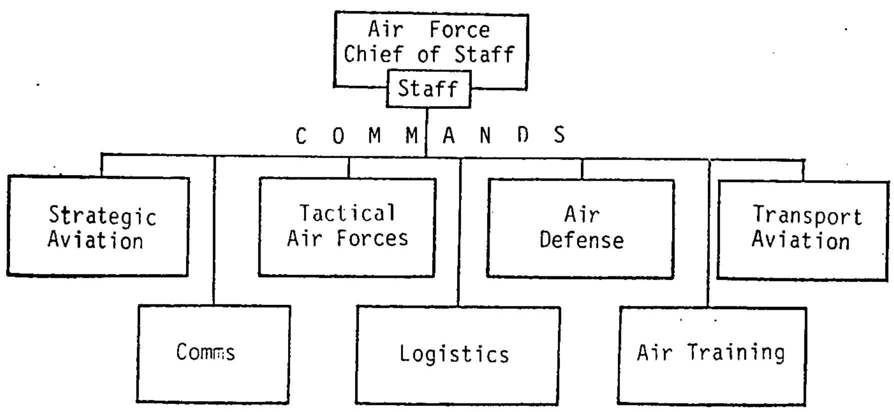

Figure 1. French Air Force Organization

The air force chief of staff (commander-in-chief) executes the direct operative leadership of the air force. He is subordinated to the Ministry of Defense and is responsible for combat mobilization readiness, working out the operational employment plans of the air force's major formations, organizing operational and combat training, equipping the air force with aviation equipment and weapons, and implementing its development plans. In his activities, he relies on the the air force staff organization, led by three of his deputies: the deputies for planning, operational issues, and the rear, to which are subordinate corresponding bureaus (directorates). Centrally subordinated services and institutions are also part of the air force staff. The similar organization of the air force staff is shown in Fig. 2.

All air force units and subunits are assigned to four territorial air districts (VVO), the headquarters of which are loacted in Bordeaux, Metz, Traverny, and Aix-en-Provence. During peacetime, the VVO commanders are responsible for logistics and for maintaining the air force's combat readiness in the territories of the subordinate districts. During wartime, they are responsibile for organizing cooperation with ground troops, navy and civilian organs regarding air defense issues while conducting joint combat operations.

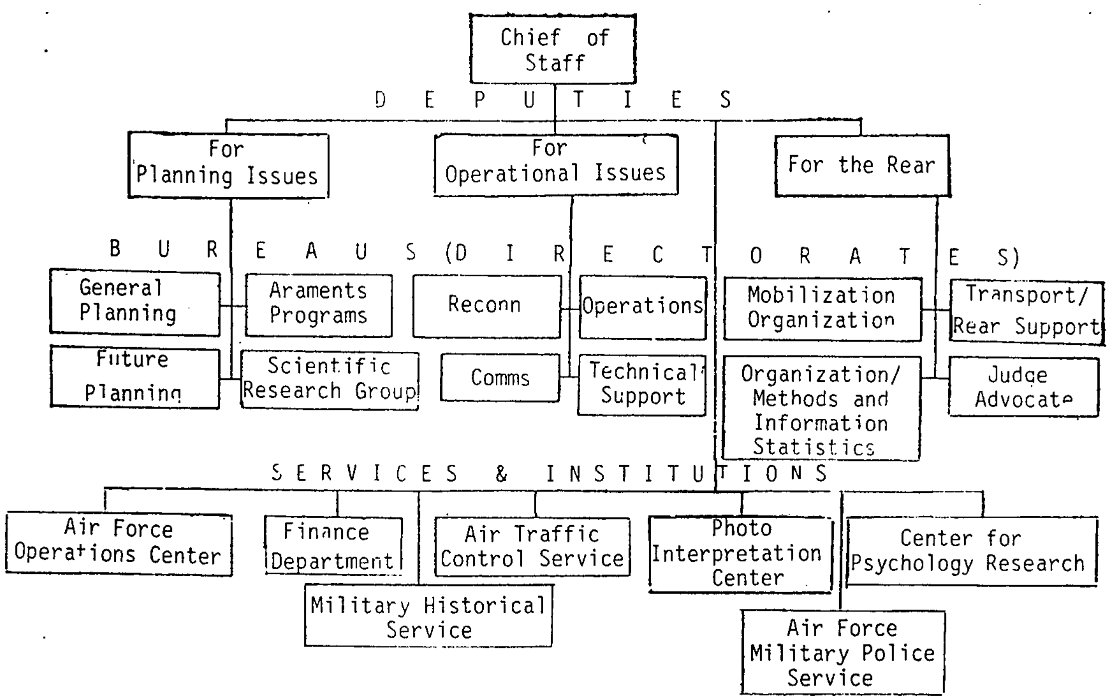

Figure 2. Organization of the French Air Force Staff

The STRATEGIC AIR COMMAND (FAS, headquartered in Taverny) combines two elements (air and ground) from the national nuclear forces "triad." The country's military-political leadership considers it and the navy's strategic command to be the main strike force. FAS's ground component consists of the 1st Medium Range Ballistic Missile Battalion (headquarterd in Apt). Its inventory includes 18 two-stage solid-fueled S-3 (BRBM) missiles with multiple warheads (the firing range is 3,500 km, and the warhead yield is up to 1 Mt). In 1982 to 1984, work was carried out to improve the shielding of all S-3 missiles, launcher silos and launch control posts against electromagnetic pulses (after this, the missile complex was designated S-3D).

The battalion is organized into two squadrons (each with 10 launchers). Both squadrons are deployed on the Plateau d' Albion in the south-eastern part of France. According to the words of the FAS commander, this region was selected because of its small population, and also terrain conditions, allowing MRBM silos to be constructed. The launchers are located at a distance of 3-8 km from one another. Launch control points (one per squadron), located 25 km apart, control them. Information on targets is inputted into the missile's on-board computer beforehand. As the foreign press reports, if necessary, the program can be changed in 1 minute, and to retarget all 18 missiles requires approximately 5 minutes. They can be launched within 7-12 minutes after an order is issued to employ nuclear weapons.

Strategic aviation includes two bomber wings (the 91st and the 94th Bomber Wings) and one refueling wing (the 93rd Flight Refueling Wing). The bomber wings include four squadrons (two in each), which are located at Mont-de-Marsan, Casaux, Avord, and St. Dizier airbases. There are 6 MIRAGE-4A medium strategic bombers in a squadron each capable of carrying one nuclear bomb. In all, there are 38 MIRAGE-4 aircraft in FAS, including 18 MIRAGE-4A and 6 MIRAGE-4P configured for combat, 6 configured for reconnaissance in the reserve, and the remaining for reequipping as ASMP (Air-Sol Moyenne Portee) missile carriers.

The 93rd Flight Refueling Wing comprises three squadrons, in which there are 11 KC-135F tanker aircraft. They are located at Istress-le-Tube (1), Mont-de-Marsan, and Avord airbases and provide aerial refueling of strategic bombers, tactical fighters, air defense fighters and transport aircraft.

The TACTICAL AIR COMMAND (headquartered in Metz) consists of two tactical air commands (the 1st and 2nd FATAC) and conducts combat operations both in the European theater of war, and in coastal territories. The commander of the tactical air forces is simultaneously the commander of the 1st VVO and his deputy is the commander of the North-Eastern Air Defense Zone.

There are five fighter-bomber squadrons in the 1st FATAC: the 3rd (located at Nancy Air Base includes two MIRAGE-3E fighter-bomber squadrons and one JAGUAR-A squadron, which is intended primarily for delivering strikes against SAMs, AAA, and radars for the purpose of enabling the MIRAGE-4A strategic bombers to break through the enemy's air defense system), the 4th (Luxeuil with two MIRAGE-3E air squadrons), the 7th (Saint-Dizier with two JAGUAR-A fighter squadrons, one combat-training squadron with JAGUAR-E aircraft, and also a JAGUAR-A squadron located at Istress-le-Tube); the 11th (four JAGUAR-A and JAGUAR-E squadrons, of which three are located at Toul-Rozier and one at Bordeaux) and the 13th (Colmar with two MIRAGE-F5 and one MIRAGE-3E fighter squadrons). There is also one reconnaissance wing in 1 FATAC (Strassbourg, two squadrons of MIRAGE-F1CR reconnaissance aircraft and one squadron of MIRAGE-3R AND -RD aircraft.

The Western press reports that one squadron of the 11th Wing is equipped with special equipment for conducting EW, and its 4th Air Squadron (in Bordeaux) renders air support to the troops in coastal territories. Besides combat aircraft, each squadron has a training detachment comprised of MAGISTER and BROUSSARD aircraft for reestablishing flight skills after flight interruptions and for independent pilot training.

As the Western press notes, the peculiarity in the organization of the French Air Force wing is that it includes only flight personnel and aircraft. Support subunits are attached to the airbases. There are 15 aircraft in each combat squadron.

Thus, in the 1st FATAC there are six air wings, in which there are 18 combat squadrons and a training squadron. In all, there are more than 300 aircraft, of which 270 are various modifications of JAGUAR and MIRAGE fighter-bombers, including 75 JAGUAR-A and MIRAGE-3E aircraft which are nuclear capable.

The 2nd FATAC (headquartered at Nancy) is responsible for the rapid deployment of new units and subunits during a threat period in wartime, and also for the formation of an air contingent of intervention forces. It does not include organic air force subunits, but if necessary, aircraft can be transfered to it from the other commands. The permanent elements of 2nd FATAC are the 4th squadron of the 7th Wing and the 4th Squadron of the 11th Wing (Istress and Bordeaux, respectively) since their crews are trained during peacetime according to a special program for operations in the coastal territories.

The Air Defense Command (headquartered in Taverny) is responsible for organizing and actually implementing measures to provide the country's air defense. It is entrusted with the missions to protect economic areas, the most important administrative industrial centers, the basing areas for the strategic nuclear forces and troop grouppins from enemy air strikes.

The country's entire territory is divided into four air defense zones (the north-eastern, northern, south-eastern, and south-western), the boundaries of which almost coincide with the boundaries of the air districts. Operational centers, command and warning posts and centers, and also observation and warning posts are deployed in each zone. Ten modern ALADIN radars provide target detection. The air defense personnel and equipment are concentrated advantageously in the north-eastern and eastern zones, on the territories where the Paris industrial region and a large part of the airbases are located.

The air defense command operations center, and also the FAS command post are located in Taverny. The French-made STRIDA-2 automated system is used to control air defense personnel and equipment. STIDA-2 is linked to the NATO automated air defense system, NADGE, and the Spanish automated air defense system COMBAT GRANDE. Communications between the control organs and posts where active air defense systems are located is accomplished by the ER-70 radio communications system.

The air defense command's active forces include four fighter aviation wings: the 2nd (two squadrons of MIRAGE-2000 fighters and one MIRAGE F-1B combat-training squadron at Dijon airbase); the 5th (two MIRAGE-F1C fighter squadrons and one MIRAGE-F1B combat training squadron at Orange); and the 12th (three MIRAGE F-1C squadrons at Cambrai). As the foreign press reports, the defense of airbases and missile sites is also provided by CROTALE SAM batteries (12) and the 20-mm twin-barreled SABER antiaircraft artillery units (240) existing in the air force inventory. A CROTALE SAM battery consists of four platoons (each with two sections). There are eight transporter-launchers, each with four guide tubes, and four radars in the entire battery. The basic load is 80 missiles.

According to foreign press information, there are 12 combat (one of them in Djibouti with MIRAGE-3C aircraft) and two combat-training squadrons in the Air

Defense Command. There are 210 aircraft in the command, including 30 MIRAGE-2000, 45 MIRAGE F-1C and 75 MIRAGE F-1C-200), equipped with an aerial refueling system, 15 MIRAGE-3C, 15 MIRAGE F-1B and 30 MIRAGE-3BE aircraft. Additionally there is a detachment of MAGISTER and BROUSSARD training aircraft in each wing.

Fighter-bombers from the Air Force's 1st FATAC and IMPROVED HAWK SAM regiments and ROLANDS (up to 120 launchers) of the ground forces, and also the SUPER ETENDARDS and CRUSADER carrier-based aircraft of naval aviation can be enlisted to execute air defense missions.

The location of the air force's control organs, including the personnel and equipment of PVO, and also the main airbases where the French Air Force's combat aircraft are located are shown in Fig. 4.

The Air Transport Command (CoTAM), headquartered at Villacoublay, airlifts troops and combat equipment in the interests of all the armed force branches. There are 6 air transport wings in CoTAM: the 60th (Villacoublay Air Base with 2 CARAVELL, 6 FALCON-20, 1 FALCON-50, and 4 DC-8 aircraft and also 4 ALOUETTE and PUMA helicopters) transports government personnel and other high-ranking officials; the 61st (Orleans, 45 TRANSALL aircraft); the 63rd (Toulouse with 30 NORATLAS, 6 NORTH-262 and 2 DHC-6); the 64th ((Evreux with 24 TRANSALLs); the 65th (Villacoublay with approximately 30 light transport aircraft; its 3rd Squadron executes communications missions in the interestes of the 2nd VVO); and the 67th (5 helicopter squadrons located at Casaux, Metz, Villacoublay, Apt and Istress; in all there are approximately 60 ALLOUETTE-2 and PUMA helicopters in them).

Additionally, there are independent air squadrons in CoTAM, in particular, the 41st, 43rd and 44th Air Communications Squadrons, which operate in the interests of the 1st, 3rd, and 4th Air Districts, respectively. There is also the 56th Special Purpose Air Squadron. They are all equipped with light transport aircraft and helicopters.

In the entire command there are more than 200 helicopters and up to 100 various-purpose helicopters. As the Western press notes, its main forces are deployed on French territory, but a small number of helicopters and light transport aircraft are based in New Caledonia, the Central African Republic, Djibouti, Gabon and Senegal.

The Communications and EW Command organizes communications and EW, and calibrates radioelectronic systems. The 51st and 54th EW Squadrons are operationally subordinate to it. Administratively, they are part of CoTAM and are located at Evreux and Metz. They have 1 DC-8 and 6 NORATLAS aircraft in their inventory. PUMA helicopters are also used to execute EW missions.

The Logistics Command has the responsibility for supplying air force units and subunits with weapons, ammunition, POL, aviation equipment and providing other types of logistic support. It is entrusted with the missions to organize the servicing and repair of aviation equipment and to carry out construction work at the airbases and other air force installations.

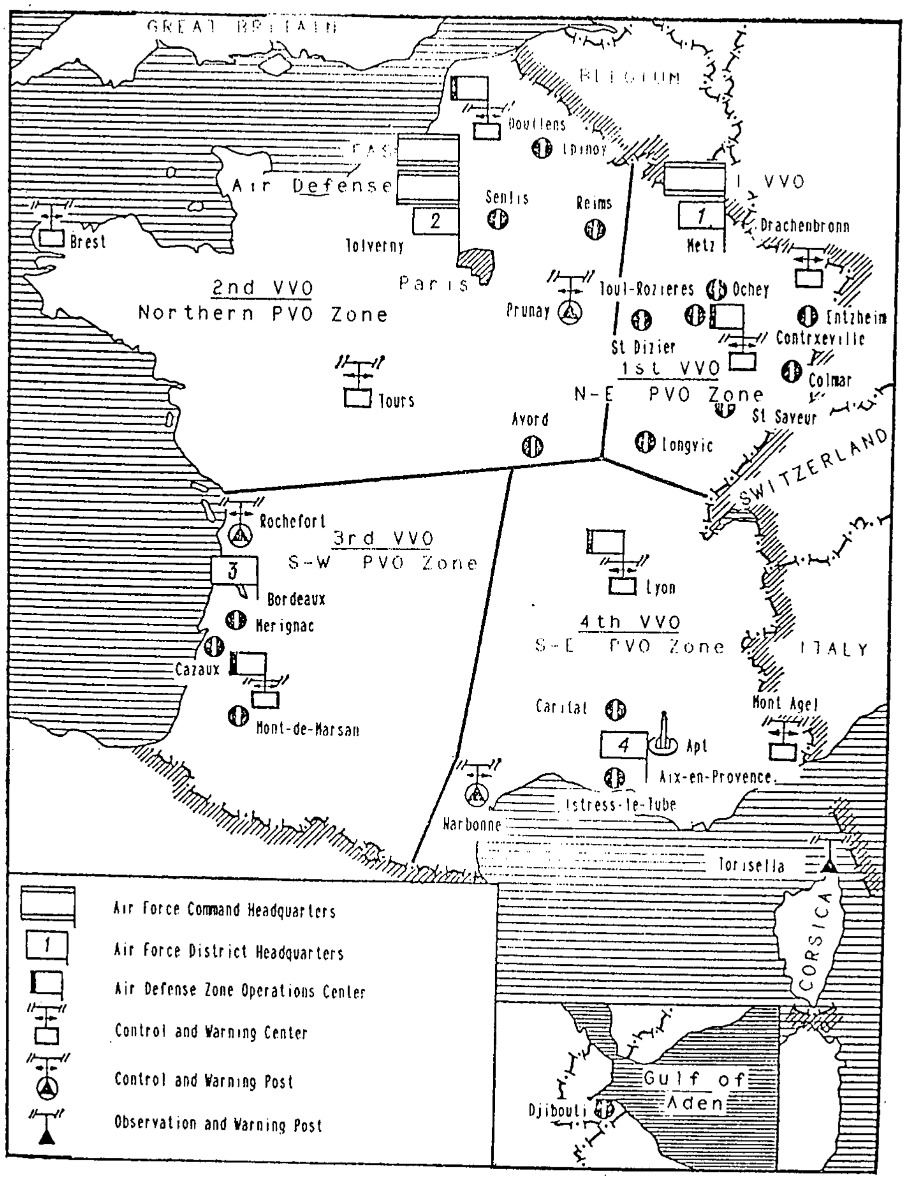

Figure 4. Location of Air Force Control Organs, Air Defense Personnel and Equipment, and also the Main Air Bases at Which French Combat Aircraft are Deployed.

The Air Training Command is responsible for training flight and technical personnel. There are more than 15 military training institutions and centers in it. The main ones are the Officers School in Salon de Provence, the NCO School in Clermont-Ferrand and the Higher Staff School in Paris.

The Officers School in Salon de Provence, which trains flight officers, engineer-technical and administrative personnel and also reserve personnel, is the main cadre training base for the air force.

There are more than 400 aircraft and helicopters in the command. Fighter and fighter-bomber pilot training is carried out in FUGA-MAGISTER (beginning flight training) and ALPHA JET (basic and advanced flight training) aircraft. After graduating from school, the trainees continue to improve their skills in the above-mentioned combat-training squadrons of the corresponding air force commands. Professional officer training consists of several stages and is carried out both in military schools and in civilian training institutions. Specifically, many officers in the air force engineering service are trained at the Higher Aeronautics and Astronautics School (Paris) and also at the National School for Aviation Engineers (Toulouse).

Air force unit and subunit COMBAT TRAINING, as the foreign press notes, is organized according to national plans with consideration given to operational measures of the NATO Allied Air Force command in Europe. Training is carried out in the form of daily training and various types of exercises. During training, great importance is attached to the development of such air force employment principles as concentrating efforts on the main axes, and also working out issues regarding the organization of close air support with other branches of the armed forces, and providing continuous, flexible and efficient control, etc.

The daily training of flight crews, ground service personnel and other specialists is conducted in the wings and squadrons. Its results are verified during exercises, organized within the limits of the air force commands, air districts, air force and armed forces as a whole. For example, the combat readiness of MRBM units is verified in the MAGENTA-Type exercises, during which, as the foreign press notes, a signal message for the employment of nuclear weapons is monitored and training to transition the missile to various stages of launch readiness is carried out. With this it is emphasized, that only 7-12 minutes occurs from the moment the country's president makes a decision, to a simulation launch of the first MRBM. The combat readiness of strategic aviation crews is verified in POKER-Type exercises, during which the MIRAGE-4A bomber crews work out the following missions: a take-off on alert, approaches targets at various speeds and altitudes, a bombing run, aerial refueling and others. Recently, they have regularly executed long flights to the English firing ranges at Derby and Spedium, where they have worked out various target destruction methods under conditions of extensive use of EW systems.

According to foreign press reports, since 1984, the French Air Force has regularly conducted large-scale air force exercises under the code name Air-Ex. During them, the combat readiness of all air force branches is verified. Specifically, the following issues are work out: the transition of the air force and air defense personnel and equipment from a peacetime status to a wartime status; the planning and execution of air operations in the initial period of war; the achievement of air supremacy on separate operational axes; the delivery of air strikes against ground targets; the organization of air defense; the conduct of air reconnaissance, EW, and others. The peculiarites of these exercises are such that their concluding phase is connected with the NATO Allied Air Forces DAT-EX exercises. For example, according to the English journal FLIGHT, the air forces of the U.S., FRG, Great Britain, Canada, Italy, the Netherlands, and Spain participated in the last two days of the exercise AIR-EX-85 (11-21 March). It had a two aspects. The sides worked out the following issues; the detection of the air enemy, target designation, the conduct of air combat and the delivery of strikes against ground targets. In all, during this exercise, French crews executed approximately 6,000 sorties, and delivered strikes against ground targets in more than 900 flights.

In recent years, tactical and transport aviation crews have worked out missions both over French territory and over the African continent. A unit of the aircraft were equipped with in-flight refueling stations which allows them to execute non-stop flights to a range of more than 5,000 km. The crews of the weapon-carrying aircraft regulary participate in the JAGUAR-Type exercises, in which they work out missions for the deployment to reserve airfields and the subsequent delivery of conditional nuclear strikes. The average flying time of a tactical aviation pilot is approximately 180 hours.

On the whole, according to the French military leadership, the air force units and subunits of all the commands maintain a high degree of combat readiness. In particular, up to 50-60 per cent of the aircraft may be ready for a combat sortie in 2-3 hours after the announcement of an alert, and the entire air force can be completely ready to execute missions in 20-24 hours.

DEVELOPMENT. The development of the air force is proceeding in accordance with five year plans worked out by the armed forces commander. The present plan (1984-1988) affirms that France, as usual, is trying to strengthen the combat power of its military machine and to be more closely tied to the NATO bloc.

As the Western press reports, the S-X mobile missile system is expected to enter the inventory of France's strategic nuclear forces in the middle of the 1990s. At first it will supplement, but then completely replace the S-3D MRBM. In the initial stage, it is planned to equip the S-X missile with a single 150-Kt warhead, and in the subsequent stage, with multiple warheads (three 150-Kt, individually-guided warheads).

Work is being carried out in strategic aviation to reequip 18 MIRAGE-4A aircraft to carry the ASMP class air-to-ground guided cruise missile with a 100- to 150-kt warhead and a firing range to 300 km. The modified version of the aircraft received the designation MIRAGE-4P. By having a missile onboard, foreign specialists figure, that these strategic bombers will be able to destroy enemy targets without entering into the operational envelope of their air defense systems. Two squadrons of the 91st Wing will be equipped with the MIRAGE-4P aircraft. It is planned to introduce the first of them into the air force's inventory in 1986.

Work is being carried out to modernize the KC-135F tankers; more powerful and economic CFM-56 turbofan engines and new on-board equipment is being installed on them. The aircraft fleet of tactical and air defense fighter aviation is being improved. For this purpose, MIRAGE F-1CR fighters continued to be delivered to the 33rd Air Reconnaissance Wing, which will be completely transitioned to this type of aircraft in 1986.

The French Air Force command associates high reliability with the MIRAGE-2000 multipurpose tactical fighter beginning to be delivered into the inventory of combat squadrons. In the 1980s, 165 of this aircraft type are expected to be introduced, of which more than half will be equipped as ASMP missile carriers.

Simultaneously, with the measures mentioned above, other measures are being carried out in the air force: aircraft and weapons existing in the inventory are being improved, new types are being developed and the command and control system is being improved, etc. However, inspite of the significant increase in the quality of aviation equipment and weapon systems, the country's military leadership continues to press the government to make a decision concerning the increase in the number of aircraft and missiles, etc.

1. This airbase is often referred to in the foreign press as simply Istress. Ed.

9355
CSO: 1801/91

CAPITALIST COUNTRIES' TRAINING/COMBAT-TRAINING AIRCRAFT

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 38-44

[Article by Col Yu. Alekseyev; "Capitalist Countries' Training/Training-Combat Aircraft"]

[Text] The previous edition of this journal presented general information on the training aircraft of capitalistic countries' air forces and their main characteristics. The design features of several types of modern training and combat-training aircraft most widely deployed in the West are presented below. Their capabilities to execute the missions entrusted to them and their areas of employment are also revealed.

The T-46A AIRCRAFT was developed for the U.S. Air Force by Fairchild as a new-generation training aircraft for basic flight training: it will replace the aging T-37B aircraft. It is necessary to develop the T-46 for two main reasons. First, a great part of the T-37 aircraft are near the end of their flying life, and secondly, the T-37 does not meet modern requirements at the beginning of the 1980s, with respect to flight characteristics, electronic equipment and "cost-effectiveness" criterion.

An important advantage of the new aircraft is the low average fuel consumption, (200 l/hr against 700 for the T-37), made possible by the TRDD (double-flow turbojet enginge) power plant. The fuel (approximately 760 liters) is accomodated in two center wing section tanks. The radioelectronic equipment includes the AN/ARN-118 component of the TACAN navigation system, the AN/ARN-27 instrument landing system, the ARK-100 (V) IFF system, the AN/ARC-164 and AN/ARC-186 (V) VHF/UHF radios and the AA/AIC-18 intercom system. The ejection seats enable an emergency escape on the ground and also during flights at speeds up to 1100 km per hour. Ejection is possible both through the canopy and after it is thrown off.

According to foreign press reports, 72 per cent of the aircraft's development has been completed using computer-aided design. The guaranteed designed service time for the airframe is 10,000 hours (or 10 years of service). For the engine, it is 1,000 hours (or two years). The airframe's general service life is 20,000 hours.

Flight trials of the first T-46A prototype commenced in 1985. The manufacturing firm is planning to develop several modifications of the AT-46 export variant: the AT-46A for flight training, the AT-46B for cannon firing training, and the AT-46C for weapons employment training against ground targets. For this purpose, it is planned to equip it with an optical sight and comparatively simple weapons control system, accommodated on four underwing hardpoints: up to 500-lb calibre bombs and a pod with 7.62- or 12.7-mm calibre machine guns, and also additional fuel tanks can be suspended on the inboard hardpoints, and up to 250-lb calibre bombs and a launcher for 70-mm rockets can be suspended on the outboard hardpoints.

The Cessna T-37B TWEET AIRCRAFT is intended for basic flight training. The fuel supply (1,170 liters) is accomodated in soft wing tanks (in six tanks in the wing panels) and in a auxillary tanks (behind the cockpit). The piloting-navigation equipment corresponds to the equipment in the cockpits of combat aircraft. The aircraft's flight range at 10,700 m altitude (with a 5 per cent fuel reserve) is 1,400 km (at a speed of 580 km/hr) and 1,500 (540 km/hr).

The T-37C aircraft has equipment for employing weapons accommodated on underwing pylons. The standard armament variants for combat training are: two suspension pods (12.7-mm machine guns with a 200 round cartridge, two 70-mm rockets, and four 3-lb practice bombs in each), two 250-lb calibre bombs and four SIDEWINDER guided-missiles. The T-37B can execute aerial reconnaissance missions. For this purpose, it is equipped with AFA (photo aerial camera) for planar or cartographic surveying. In order to increase the flight range, additional fuel tanks with a 245-liter capacity can be attached on the wing tips. The aircraft's flight range at 7,600 m altitude at a speed of 520 km/hr is 1,360 km (with additional fuel tanks on the wing tips) and 1,340 km at a speed of 430 km/hr.

The A-37 light ground-attack aircraft was developed on the basis of the T-37. It is equipped with more powerful TRD (turbojet engines) and four underwing pylons under each wing panel, designed for a maximum load of 390, 390, 270 and 230 kg. The A-37's maximum take-off weight was increased to 6350 kg.

The T-1 HAWK AIRCRAFT was developed by the British firm, British Aerospace, and is intended for basic and advanced flight training and weapons employment training. At the same time, as the foreign press notes, it can be used as a light ground-attack aircraft, air defense interceptor, or for conducting photo aerial reconnaissance or EW. It was designed with a low-set wing structure. The fuel supply in internal tanks (a fuselage and an integral wing tank) is 1,700 liters. The piloting-navigation equipment is standard. The airframe was designed for 6,000 hours of flying time, the maximum permissable aircraft load without external suspensions with a complete fuel supply in the internal tanks (or with a load on an external suspension of 1,360 kg and 60 per cent fuel remainder in the internal tanks) is +8 and -4. The aircraft does not have built-in armament. Suspensions and other equipment are accomodated on an underfuselage pylon and four underwing pylons. To increase the flight range, two suspension fuel tanks with a capacity of 460, 590 or 860 liters can be used.

In trying to retain the HAWK aircraft commodity market in its own hands, the firm is continuously expanding the aircraft's capabilities. Specifically, it is reported that a computer-based digital stability control system is being developed, which simulates a wide range of control features. The simulation of forces on the aircraft's control organs forms the basis of the system. Consequently, the control organs in the instructor cockpit are directly connected with aerodynamic surfaces, and in the trainee cockpit through the computer and the forces simulation unit. The instructor can specify various control conditions, for example, to simulate the variable wing sweep angle, as on the TORNADO fighter. In order to simplify the design, the system was designed as a single channel system (without a backup).

Besides the basic variant, several export variants of the HAWK aircraft are being developed (the series 50 and 60). For example, the HAWK-60 has a more powerful engine (2,590 kg of thrust). The maximum take-off weight was increased to 8,570 kg and the maximum flight speed increased to 1,040 km/hr. Among the various onboard armament, it can carry: seven 1,000-lb calibre bombs, nine 227-liter napalm bombs, two STINGRAY torpedoes and two 590-liter fuel tanks; one SEA EAGLE antiship missile (PKR), two SIDEWINDER guided-missiles and two 860-liter fuel tanks. The aircraft's operational combat radius is 1,000 and 1,450 km with a 2,270 kg and 910 kg payload respectively. The ferry distance with two 860-liter tanks is more than 4,000 km.

An improved HAWK-1,000 variant is being developed for operations against ground targets. It is planned to employ the SKN-2,416 inertial navigation system (as on the F-16 aircraft), a laser rangefinder and forward-looking IR system. The maximum payload is being increased to 3,270 kg. With a variable flight profile (high-lo-high altitude), its operational combat radius is 1,200 km (with two 1,000-lb calibre bombs) and 500 kg (with seven). The available patrol time at a radius of 260 km is 3.5 hours. Work is also being carried out to develop a single-seat HAWK-200 aircraft with a maximum take-off weight of more than 8600 kg.

The T-5 JET PROVOST AIRCRAFT was developed by the English firm British Aircraft Company for beginning and basic flight training. The fuel supply (1,190 liters) is located in wing tanks (one integral tank and three in each wing panel). Additional tanks can be installed on the wing tips (220 liters) and on the inboard suspension pylons. The cockpit's piloting-navigation equipment is standardized.

The JET PROVOST 5S is the combat-training export variant of the aircraft. It is equipped with two built-in 7.62-mm machine guns (in the forward part of each side intake) and four underwing pylons, on which various bomb variants, the AS-11 air-to-surface guided-missile, and rocket launcher racks can be suspended. For executing photo aerial reconnaissance, two pods with AFAs can be accomodated on them. Standardized 340-liter or 430-liter suspension fuel tanks can be used to increase the flight range.

The SKYMASTER-167 (modifications 80, 81 and others depending on the import country) with a maximum take-off weight of 5,220 kg is an improved export variant of the T-5 JET PROVOST aircraft. The fuel supply in its internal tanks was increased to 1,230 liters. With a complete fuel supply in the internal tanks and the suspension of 220-liter tanks on the wingtip panels, the aircraft's payload is 1,200 kg. The flight range (90-kg fuel reserve) is 1,170 kg for the combat training variant (take-off weight is 3,790 kg) and approximately 2,000 km for the combat variant (4,760 kg).

The ALPHA JET AIRCRAFT was developed jointly by France and the FRG as a combat-training aircraft for basic and advanced flight training (including at low altitudes), for weapons employment training, and also as a light ground-attack aircraft. With the clean aircraft's corresponding moderate weight (3,500 kg), the fuel supply in its internal tanks is 1,900 liters. The maximum payload is 2,500 kg. The onboard fuel supply can be increased by using two suspension tanks with a 310- or 450-liter capacity. To satisfy the requirements for use as a light ground-attack aircraft, the ALPHA JET was designed to emply various armament, including bombs up to 400 pounds, a 27- or 30-mm cannon and bomb dispensers weighing up to 280 kg.

To increase the aircraft's capabilities in pilot training and weapon employment, the French firm Dessaux-Brege developed its improved variant, the ALPHA JET-NGEA, which is equipped with a new inertial navigation system, weapons control system, information display on the background of the windshield, a laser rangefinder and radio altimeter. The aircraft's flight characteristics were also improved with the installation of more powerful engines and the suspension of large additional 625-liter capacity tanks on the inboard underwing hardpoints and 450-liter capacity tanks on the outboard hardpoints. For example, with two 500-lb calibre bombs, a pod with a 27-mm or 20-mm calibre cannon and two 450-liter suspension fuel tanks, the ALPHA JET-NGEA's operational combat radius is 1,200 km. Besides operations against ground targets, in French specialists' opinions, this aircraft can be used to escort aircraft, combat helicopters and execute air defense missions at low altitudes.

Besides the French and FRG Air Forces, the ALPHA JET is being produced for export. Specifically, it is being produced under the name ALPHA JET MS1 or MS2 for the Egyptian Air Force. The first variant is a combat training aircraft, and the second is a new-generation aircraft for direct air support to the ground troops. Flight trials of a supercritical wing and original direct aerodynamic forces control system are being carried out according to the joint French and West German ALPHA JET program. The practical application of these systems, according to Western experts' evaluations, will enable its maneuverability to be substantially increased.

Presently, according to foreign press reports, the French firm Dessaux-Brege is planning to develop a new aircraft variant receiving the designation LANSE. It is planned to equip it with the Agava radar, a forward-looking IR system and a computer (the same computer as on MIRAGE-2000 fighters), thereby providing it with an all-weather, 24-hour employment capability. It is considered, that the new onboard equipment will provide the capability to fly the aircraft in a barrier cap mode, to effectively conduct aerial combat by using the MAGIC guided missiles, to employ air-to-ground class guided-missiles with a laser guidance system and the EXOCET antiship missiles out to a range of 50 km.

The TB-30 EPSILON AIRCRAFT, for beginning and basic flight training, was developed by the French firm Aerospacial. In its development requirements, the French Air Force command specified that it must be inexpensive and not required large operational expenditures, but at the same time possess flight efficiency and controlability features, comparible with modern aircraft. French specialists intend to substantially simplify the flight training system using the EPSILON aircraft. Specifically, it is planned to replace beginning flight training on the CAP-10B aircraft and basic flight training on the CM.170 MAGISTER aircraft with training only on the EPSILON, after which pilots must transfer to advanced flight training on the ALPHA JET aircraft. During the the first months that the EPSILON was operational, its combat readiness reached 66 per cent. Inspections are conducted periodically every 200 hours of flying time. The French Air Force command considers, that the time between inspections must be increased to 400 hours of flying time and the combat readiness increased to 80 per cent.

The foreign press notes, that a combat variant of the EPSILON aircraft is being developed especially for export. Its take-off weight is being increased to 1,400 kg, and the payload will be 250 kg with a two-man crew) or 300 kg (with a one-man crew). The payload is accomodated on four underwing hardpoints (the inboard hardpoints are designed for a load of 160 kg and the outboard hardpoints for a load of 180 kg). The aircraft will employ bombs and missiles, and can carry machine guns in pods. The wing attachment points to the fuselage are reinforced, and the maximum designed aircraft load with weapons on the underwing suspensions was reduced and is +6 and -3. The aircraft's operational combat radius with various armament variants is: 210 km with four rocket launcher racks, a fuel reserve for 5 minutes loiter time in the target area, 20 kg for landing and a one-man crew; 430 km with four 7.62-mm machine guns in two pods and a 500 round cartridge (fuel reserve and crew similar to take-off with rockets); 300 km with two 125-kg calibre bombs.

The SF.260M AIRCRAFT for beginning flight training was developed by the firm SIAI-Marketti. The fuel supply (235 liters) is accommodated in two metal wing tanks and two tanks on the wing tips panels. The piloting and navigation equipment is standard. It is reported that it can be used for basic flight training, and if neccessary, can be equipped as a three seat variant. The designed maximum load of the SF.260 M is +6 or -3 with a take-off weight of 1100 kg. It is +4.4 or -2.2 with a take-off weight of 1,200 kg.

The combat training variant SF.260W, the WARRIOR, has a maximum take-off weight of 1,360 kg. It is equipped with four underwing hardpoints, designed for the attachment of standardized NATO pylons. The aircraft's maximum payload (machine guns, rockets or bombs) is 300 kg. To increase the flight range, two 80-liter suspension fuel tanks can be used. Depending on the armament type and flight profile, the aircraft can execute combat missions at radii from 90 to 560 km (with a one-man crew and a 20-kg fuel reserve). The available time for patrol flights at a radius of 90 km is more than 5.5 hours (the armament consisting of two 7.62-mm pod-contained machine guns and a full fuel supply in the internal tanks). The ferry range is approximately 1,720 km (with a two-man crew, two 80-liter suspension fuel tanks, and a fuel reserve of 30 kg).

In the beginning of the 1980s, the firm developed an improved variant of the aircraft, on which the piston engine was replaced by a 350-hp turbojet engine The weight and geometric characteristics of the new aircraft were practically the same as those of the SF.260W, but the flight characteristics were substantially improved (in particular, the flight speed, the climb rate and service ceiling).

The S.211 AIRCRAFT was developed by the Italian firm, SIAI-Marketti, for basic and advanced flight training. It can also be used as a light ground-attack aircraft. Its distinguishing features, according to Western press reports, are the small relative structural weight, and the spin and stall stability. In addition to the standard radioelectronic and navigation equipment, a Doppler radar, and a radar for controlling weapons or other equipment (including EW equipment) can be installed on it. The aircraft can conduct aerial reconnaissance, for which it is equipped with with AFAs in two suspension pods. Additional fuel tanks with a 350-liter capacity can be used on it to increase the flight range.

The MB.339A AIRCRAFT was developed by the Italian firm Aermakki for basic and advanced flight training and as a light ground-attack aircraft to replace the MB.326 and G.91T aircraft in the Italian Air Force. Foreign specialists consider it to be a second-generation training aircraft. It is considered, that the design and maintenance simplicity of the British-designed VIPER turbojet engine, are its advantages, despite its high specific fuel consumption (0.97kg/kg x hr). The airframe is designed for 10,000 hours of flying time (20,000 landings), and the cockpit for 40,000 pressurization cycles. The maximum design load for the aircraft, without external suspension, with a full fuel supply in the internal tanks, is +8 and -2. With external suspensions with a take-off weight of 5,900 kg, it is +5.5 and -2. The planned labor expenditure for the technical servicing of the MB.339A is four person-hours per hour of flying time.

The capacity of the internal fuel tanks (the central fuselage tank and on the wing tip panels) is 1,400 liters. Two 325-liter tanks can be installed on an underwing suspension. Refueling is carried out under pressure. The armament is accomodated on six underwing hardpoints; the inboard and middle hardpoints are designed for a load of 450 kg, and the outboard harpoints for a load of 340 kg. Cannon (one 30-mm DEFA cannon with a 120 round cartridge) and a machine-gun (one 12.7-mm machine gun with a 350 round cartridge) pods were specially developed for the MB.339A by the Aeromacci firm, and can be suspended on the inboard hardpoints. The MAGIC and SIDEWINDER air-to-air guided missiles can be installed on the outboard hardpoints.

The flight range at 9,000 meters altitude is 1,760 km (length of time 2 hours and 50 minutes) for the variant without external suspensions, and the ferry distance with two suspension tanks is 2,100 km (3 hours and 45 minutes). The operational combat radius with six 500-lb bombs (take-off weight 5,900 kg) is 390 km. With two 500-lb bombs and two suspension tanks it is 590 km.

In the Italian Air Force, after 40 hours of flying time on the SF.260 aircraft, cadets take a 220-hour training course on the MB.339A and then complete flight training on the TF-104 and are trained for flights on the TORNADO fighter.

The E-25 AIRCRAFT was developed by the Kasa firm as a replacement for the aging AE-10B (HA-200D SAETA) training aircraft for basic and advanced flight training and mastering weapons employment skills (the firm designation is C.101 AVIOJET). The American firm, Northrop, and the West German firm, Messerschmitt-Belkov-Blohm participated it its development. The E-25 was structurally designed with a low-set wing. The power plant consists of one American TFE73 TRDD with a thrust of 1,590 kg. The large fuel supply in the internal tanks is considered to be the aircraft's distinction, which in usual conditions holds 1,730 liters, and in distillation conditions holds 2,400 liters (in this case, the integral wing tanks, located in the wing tip pannels are fueled). Refueling can be carried out under pressure or by gravity. The use of suspension fuel tanks on the aircraft is not envisioned.

The armament is stowed on six underwing hardpoints and in an underfuselage compartment under the rear cockpit. The maximum load of the underwing hardpoints is: 450 kg for the inboard hardpoints, 340 kg for the middle hardpoints and 225 kg for the outboard harpoints. The underfuselage compartment is intended to accomodate cannon and gun armament (in the standard variant, one 30-mm cannon or two 12.7-mm machine guns, or various equipment (AFA, EW, or a laser target designator). Without external suspensions, the aircraft is designed for a maximum operational load of +7.5 and -3.9. With suspensions and a take-off weight of 5,600 kg, the operational loads are +5.5 and -2.4. The fuel supply provides a maximum flight time of 7 hours. The operational radius with two 500-lb calibre bombs and a 30-mm cannon, and flying a ferry flight profile is 830 km. At low altitude with four bombs, a 30-mm cannon and two rocket launcher racks, it is 185 km.

After completing flight training on the T-34 piston aircraft, cadets begin training on the E-25, and then on a two-seat combat variant aircraft. Specifically, it is reported that with a take-off weight of 4,700 kg (a 1,160-liter fuel supply), the E-25 can execute two training flights lasting one hour each without refueling.

The E-25 aircraft is produced in the following variants; the C.101EB is for the French Air Force; and the C.101BB is an export combat-training aircraft. In Chile it is designated the T-36 HALCON and is equipped with a 1,680-kg thrust engine. It is assembled under license. The C.101CC is a light ground-attack aircraft; the C.101DD is and improved combat-training aircraft, equipped with additional onboard equipment and the 2,130-kg thrust TFE731-5 engine.

The PC-9 AIRCRAFT for basic and advanced flight training was developed by the Swedich firm Pilatus and is and improved variant of the PC-7 aircraft. The PC-9's maximum take-off weight was somewhat increased (3,200 kg against 2,700 kg for the PC-7). However, the use of the more powerful turbojet engine (950 hp), significantly increases its flight characteristics, especially the climb rate. With a fuel supply in the internal tanks alone, the aircraft's maximum flight range (at 7,500 m altitude) is approximately 1,800 km. With two suspension tanks it is doubled. The airframe was designed for 20,000 hours flying time and the wing for a maximum load up to 11. Besides the usual piloting-navigaiton instruments, the cabin has two multi-function displays. The aircraft can carry various payloads weighing up to 1,000 kg on the inside suspension.

The T-27 TUCANO AIRCRAFT was developed by the Brazilian firm, Embraer, for basic flight training. The selection of the powerplant from one TVD (the PT6A-25C, made by a Canadian division of the American firm Pratt and Whitney) is based on the experience accumulated by Embraer in constructing aircraft with turbojet engines. The pilot and instructor seats are arranged in tandem. As Brazilian experts think this scheme provides the most realistic situation in the cockpit for pilot and weapons employment training. While not negating the positive effect on the cadet of the instructor sitting in a row in the beginning training stage, at the same time they consider that such a seating arrangement imposes a serious limitation on the weapons employment capabilities and training in group flights at low altitudes.

The IA-63 PAMPA AIRCRAFT was developed for basic and advanced flight training, and for weapons employment training by the Argentine firm Fabrica Militar de Avionos with the technical aid of the West German firm, Dornier. The fuel supply in the internal tanks is 980 liters. Additional 200-liter capacity tanks can be suspended on two inboard underwing pylons. The aircraft is equipped with a single point pressure refueling system. The fuel supply in the internal tanks provides a maximum flight range of 1,500 kh (take-off weight of 3,800 kg, flight speed 560 km/hr, altitude 4,000 m). The IA-63's navigation and radioelectronic equipemtn provides the capability to train for instrument flights and landings.

The Argentine Air Force command plans to replace the M.S. 760 French-made training aircraft with the IA-63 and to employ them for pilot training for flights on single-engine combat aircraft. The planned training course for this is 30-50 hours. It is planned to produce approximately 100 aircraft for the Argentine Air Force and the same number for export sale.

The T-4 AIRCRAFT is being developed jointly by the Japanese firms Kawasaki, Fuji and Misubishi for basic flight training. it is planned to use it to replace the T-1A/B aircraft (introduced into the inventory in 1958-1962), used for basic flight training, and the T-33A, used for the second stage of beginning flight training. They think, that the T-4 will reduce the time for pilot training in these stages from 11 to 9 months and correspondingly, the general required flying time from 185 to 140 hours.

The T-4 is a monoplane with a high-set swept wing and a powerplant consisting of two double-flow turbojet engines. The crew is arranged in tandem, with the instructor seat slightly elevated. The duplicate control of the aircraft is standard, and the flight control system is electric-powered. The main fuel supply is accommodated in three fuselage tanks. Suspension tanks can also be installed; one underfuselage tank with a capacity of 760 liters or two underwing tanks with 450-560 liters. One underfuselage and four underwing hardpoints are envisioned for external payload suspensions. The estimated wing service time (based on fatigue strength) is 7,500 hours of flying time.

Japanese specialists consider the most complex problem in the aircraft's design to be the development of a light double-flow turbojet engine. The selected engine, the XF3-30 by the Fugi firm attained 1,660 kg of thrust during bench tests. It is modular (from five main sections) and has the following main characteristics: an air consumption of 34 kg/sec; the degree of double-flow is 0.9; the gas temperature ahead of the turbine is 1,050 degrees C; the specific fuel consumption is 0.7 kg/kg x hour; the high-speed turbine rotational speed is 21,000 rpm, and the low pressure rotational speed is 15,300 rpm.

Flight trials of the T-4 commenced in 1985. In all, it is planned to produce 200 aircraft for the Japanese Air Force.

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CSO: 1801/91

UNITED STATES 'MARITIME STRATEGY'

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 49-53

[Article by Capt 1st Rank V. Chertanov; "United States 'Maritime Strategy'"]

[Text] The aggressive essence of American "Maritime Strategy" as a fundamental element of U.S. military strategy, is acknowledged in full with frank cynicism in the Western press and underscored in international practice, where the principle of unrestricted application of force "in the interests of the state" has entered the ranks of national policy, and the concept of international morality and ethics has been replaced by motives of profit and "national interest."

Since the Second World War, the U.S. has been the instigator of more than 200 armed conflicts well beyond the borders of the North American continent and their fleet and Marine Corps has been involved in all these instances of widespread terrorism and aggression, threats of the use of force, and extortion. Korea and Cuba, Vietnam and Lebanon, Grenada, Libya and Nicaragua - these bear witness to the real global aggressive drives of the U.S. being realized through use of force and its will.

U.S. "Maritime Strategy," which points out the course of force development and utilization in combat, is based, in the view of U.S. military theorist, on three main principles: "strategic intimidation," "quick reaction," and "forward defense."

The first envisions the maintenance of all armed force components, including the Navy, at a level which guarantees successful superiority over the forces of a potential enemy under any circumstances and their readiness for any kind of action; from "showing the flag" to conducting stragetic nuclear strikes.

The second principle, depending on the character and degree of the threat, addresses planning for deployment of strategic nuclear forces into a TVD or general purpose forces in a variety of situations, including sharply provocative ones.

The third principle is derived from the U.S. politico-military leadership's geopolitical calculations and the experience of WWI and WWII; the transference of the so-called "first line of defense of American interests" to the oceanic TVDs. This principle carries a sharply reflected aggressive character. It envisions deployment of U.S. naval, air and missile bases on the territories of foreign states as well as the use of forward deployed groups of forces along threat routes as a kind of first strike echelon in the event of a sudden deterioriation in conditions and the entry of the U.S. into armed condlict on a large scale or local basis. This principle, at its most basic level, points out the course of development and combat employment of the U.S. Navy.

The fundamental assignment of the U.S. Fleet, as confirmed by the U.S. legislature, is to be in constant readiness for the sudden onset and protracted prosecution of naval operations.

Consequently, the Pentagon assigns the fleet the major role in establishing superiority in the expanse of the World Ocean, and has laid on the fleet the fundamental requirements of constant combat readiness and high combat stability of its submarine, surface, air and ground forces.

Combat readiness is a designated strategic factor in planning for transition from peace to war and for the timely completion of a mobilized and operational-strategic deployment of all components of the armed forces, including the navy. In the process, the most combat ready portion of the regular Navy (up to 70 per cent) is already deployed, in peacetime, as forward groups (6th and 7th fleets), and as their second echelon (2nd and 3rd fleets). The following are the basic sources for ultimately filling out the fleets (in terms of the degree of attaining the necessary degree of readiness): newly-built ships and vessels; combatants and ships following repairs; reconfigured ships or those taken out of reserve; mobilized ships of the commercial fleet and ships of the Coast Guard.

Combat stability of groups, components and ships in carrying out protracted combat activities is attained as much by creating a far-flung system of combat and rear security, including forward and rear bases and staging areas, air bases, mobile rear security, intelligence, reconnaissance, navigation and communications, as by high performance characteristics of ships, weapons and military technology.

MAIN TASKS AND FUNCTIONS OF THE U.S. NAVY. Pursuant to SECDEF INST 5100.1, the naval forces of the U.S. are called upon constantly to modernize the organization, training and equipping of units and elements to conduct timely and sustained combat action, including sea- and land-based air operations, against enemy naval forces at sea and in his bases and against his commercial fleet with the object of achieving and maintaining overall military superiority; establish superiority at sea and air supremacy in the important maritime regions; defend strategic transoceanic lines of communication; seize and defend forward maritime bases and carry on necessary land and air operations in support of the Navy and ground forces in littoral regions.

This entire complex of missions, according to U.S. defense strategists, defines the two basic functions of the U.S. Navy; the struggle for maritime superiority and the conduct of strikes from the sea, which are mutually linked and complement each other. In order to wage strike warfare from the sea (carrying out of missile, air or artillery strikes against shore targets, or landing of marines), it is first necessary to achieve superiority in the given maritime region. And conversely, these same maritime strike forces play an essential role in fighting for and maintaining superiority in the region; that is, in the fight against opposing enemy naval groups. Both functions assure the ability to furnish support by fleet forces to the combat activities of ground forces and marines in littoral regions.

Considering all these operational-strategic prerequisites, the U.S. Navy leadership has evolved three main directions for use of Naval forces in the event of war: strategic nuclear threat (coercion), defense of sea lines of communications (SLOC) and support of combat actions of ground forces in the main continental TVD. In addition, in support of the White House's expansionist economic and political drives, in peacetime the Navy assures a military presence in the forward oceanic and maritime areas, as well as a demonstration of force and participation in local conflicts to resolve crisis situations on U.S. terms in various regions of the world.

STRATEGIC NUCLEAR THREAT (COERCION). In readying for war against the USSR, U.S. military leadership assigns considerable attention to the inclusion in the armed forces of that component of the strategic nuclear force which could guarantee a retaliatory nuclear strike after an initial exchange. Nuclear-powered ballistic missile submarines (SSBN) are considered one of the important components of the strategic "triad." With sufficient stand off distance and accuracy to destroy military and industrial targets as well as political and administrative centers of an enemy, SSBN forces possess, in comparison with ICBMs and strategic bombers, greater combat stability, covert deployment and survivability. Therefore, they can be used not only as a first strike platform, but also to execute follow-on strikes against enemy targets which have survived. The most vulnerable element of these forces is communications which depend on the condition of command components and the success of continuous radio communications with submerged submarines following enemy nuclear strikes against the national operational control systems for the armed forces. However, U.S. Navy representatives do not reflect any serious reservations about the capability of these systems to perform even in conditions of nuclear action.

The second component of U.S. Navy nuclear forces are nuclear-armed carrier-based aircraft. Up to the middle of the 1960s, that is, before the appearance of the SSBNs, they served as the sole means of nuclear weapons delivery in the Navy. Now sea-based bombers complement, in part, the submarine missile system, since they possess a greater accuracy for target destruction. However, they cannot serve as an actual means of retaliatory nuclear strikes. In view of the low level of covertness and vulnerability to nuclear weapons, aircraft carriers, in U.S. defense specialists' opinion, are useful now only in the general purpose forces of the Navy.

To wage nuclear war, they plan to use as well multipurpose nuclear submarines (SSN), capable not only of opposing enemy strategic strike forces, but of carrying out strikes with medium range cruise missiles with nuclear warheads.

SLOC DEFENSE. The necessity to protect the transoceanic sea lanes in the most direct manner is closely linked to the concept of the so-called "forward defense." Unhindered use of the SLOCs, as stressed in the foreign press, is critically vital for sustaining combat stability of those U.S. forces deployed in forward areas as well as for supporting the economy of the country at wartime levels.

The organization for SLOC defense in a general war, according to U.S. defense specialists, must be drawn up pursant to the objectives of strategic operations in a maritime TVD. It will include: achieving superiority in key areas of the world (e.g., in the Northeast Atlantic, the Mediterranean and Arabian Seas) through destruction of enemy naval forces at sea and in bases; blockading straits and narrows; creating antisubmarine zones and laying mine fields along the routes of deploying submarines; conducting strike operations by submarines, surface ships, and carrier-based and tactical aviation against deployed enemy naval groups; denying the enemy use of forward bases and allied territory in various regions of the world; creating defensive zones in the key points of the SLOCs at the approaches to the European and Asian continents; actual escorting of convoys and organizing the transit of amphibious assault units under the protection of surface and air escort forces utilizing moving superiority zones and defended zones of sea communications along their movement routes.

At all of the steps of the strategic operation in defense and security of SLOCs, it is planned to involve widely naval forces of the U.S. allies, especially in blockading the straits of the Baltic, Black, and Japanese Seas, as well as in the antisubmarine zones in the North Atlantic.

GROUND FORCE COMBAT SUPPORT. Judging from the material in the foreign press, several variants on the use of the Navy are envisioned to furnish support to ground forces in the continental TVDs depending on the course of the armed conflict.

Strategic sea-based nuclear missile forces can be used both in nuclear war within a TVD as well as in a general nuclear war. A portion of the U.S. SSBN force, concurrently with French and British submarines, are subordinated to the NATO High Command in Europe for conducting "limited" nuclear warfare in Europe.

Carrier-based aviation can be used to cover the northern and southern flanks of NATO in Europe, in the Japanese Islands and to participate in combat strikes in Europe and the Far East, especially when U.S. Air Force tactical and strategic aviation are burdened with difficult basing conditions.

Naval amphibious operations are necessary during the expansion of local conflicts or to seize strategic staging areas in a general war, and naval amphibious and other transport resources will be used to lift ground troops and Marines into designated combat areas assigned either before or during the course of the war.

The degree of opposition to naval forces while providing support to ground forces in littoral regions can be insignificant (especially in local conflicts) or full-scale. In the latter case, as in organizing for defense of the SLOCs, it is mandatory to conduct preliminary naval operations to gain superiority in a given region of the maritime TVD.

The high strategic mobility of the carrier battle group and the amphibious capability of U.S. Marines permits successful cooperation in combat actions in continental TVDs in accordance with the majority of options of waging war in NATO planning. However, as indicated above, the opinion remains among U.S. Navy specialists that carrying out combat actions from sea in a general war, which includes furnishing support to ground forces, must be strictly coordinated with operations to achieve maritime superiority at sea and subordinate primarily to the solution of that problem.

PROSPECTS FOR CHANGING U.S."MARITIME STRATEGY." The fundamental principles determining the essential contents of the maritime strategy, in U.S. military experts' view, are universally known and have remained constant for many years. Only the qualitative and quantitative structure of the fleet, which is the result of scientific and technical progress as well as new ideas on how to use the fleet in various regions to solve these or other problems, is subject to change.

Inour time, the horror of the aggressive policies of the U.S. administration in the international arena, the assertion of even newer regions of "a sphere of national interest" of the U.S., and the propagandistic uproar over the "military threat" of the USSR and countries of the socialists camp, serve as the provocative basis for unprecedented measures to construct new ships and to increase the ship inventory in peacetime up to 600 and more units (in wartime, fleet numbers could be significantly higher), and to buy new kinds of aircraft and weapon systems. The makeup of the U.S. fleet is such that it is possible to deploy 15 carrier and 4 surface action groups (each of the latter with a battleship), up to 100 nuclear attack submarines, and to simultaneously lift one division and one marine brigade to an overseas TVD.

According to the strategy of "direct defense," assumed by the U.S., the Navy is expected to conduct wide-ranging strike actions in at least two basic maritime theaters, in which combat actions in the Pacific and Indian Oceans, according the U.S. military specialists, will assume even greater importance.

As a result of the entry of the cruise missile, the strike power of nuclear attack submarines and surface combatants has grown, and a portion of the mission of carrier aviation to conduct strikes against land targets has diminished. Instead of that, the traditional functions in defense of the carrier strike group and submarines (AAW and ASW) possess a strike character. Carrier fighters (F-14 TOMCAT) and the fighter-bomber (F/A-18 HORNET) have been retargeted first toward combat with missile-carrying naval aviation, that is, toward the destruction of the primary carriers of anti-ship weapons. Even the carrier based bomber (A-6 INTRUDER) is armed with air-to-air missiles. American military specialists consider that bombers and fighter-bombers can be targeted against land targets only after the destruction or neutralization of enemy naval forces.

Analogously, submarines, which are the primary ASW system in defense of convoys and in ASW zones, will be moved into positions of immediate proximity to basing points of enemy naval forces with the objective of tying up and destroying their ASW forces as they deploy. It is expected that the new SSN-21 SEAWOLF-Class SSNs will be especially effective in this role.

Such aggressive strike actions, it is supposed in the West, will facilitate in a maximum way the execution by the fleet of its basic mission; guaranteeing freedom of movement along the SLOCs.

With reference to the complexity of the problems of armed warfare at sea, U.S. naval strategists consider that the 600-ship Navy, limited by budgetary considerations, is not the maximum, but the minimum and is searching out any possible ways to strengthen it. Some of the measures include, even in peacetime, marine amphibious command ships for the timely positioning of arms and combat equipment and the immediate lift of troops and cargo, as well as ships and vessels of the Coast Guard for actions in zonal areas, fishing vessels and ships of small displacement for use in a range of minesweeping duties. A memorandum of understanding exists between the Navy and Air Force over joint operations in the maritime regions. Finally, an estimate has been made concerning mutual operations with allies not only in support, but in several main combat functions. All this brings up several supplementary difficulties in interoperability of weapon systems, command and communications. However, in Pentagon strategists' estimate, as a whole, they facilitate ensuring the multipurpose preparedness of the Navy to participate in a new world war and in local conflicts.

9355
CSO: 1801/91

U.S. NAVY SHIP TACTICS WITH TACTASS SYSTEM

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 53-55

[Article by Capt 2nd Rank V. Surnin; "U.S. Navy Ship Tactics with TACTASS"]

[Text] The U.S. Navy considers one of the main obstacles on the path of achieving fleet superiority in maritime areas to be the probable enemy's submarines. For this reason, the U.S. is paying almost exclusive attention to solving the problem of combat against them. Along with construction of modern ASW ships, considerable work is being done on design and equipping them with new types of weapons and systems, including acoustic detections systems.

Recently, there has appeared in the foreign press material about equipping ships with acoustic systems of a new type; a sonar system with an extended towed array. In U.S. military specialists' opinion, these systems have substantively increased the effectiveness of ASW forces. The creation of such systems has permitted a significant (almost an order of magnitude) increase in submarine detection range in comparison with systems with fixed, hull-mounted arrays. This has become possible through the use of the subsonic (VLF) frequency band whose signals (for example, submarine sound emission), propagate for a considerable distance with less attenuation than high frequency, which are used in hull-mounted systems.

Subsonic oscillations have a very long wavelength (tens of meters); in connection with which the receiving array, for quality performance, must have a wide aperture. The Tactical Towed Array Sonar System (TACTASS) was built with this in mind. Their arrays, whose length is in the hundreds of meters (for example, the AN/SQR-18 array is 250 m long), are towed by the ship using an armored cable, linking the array with the onboard gear for receiving, processing, analysis and display of the acoustic sugnals. Specifically, the AN/SQR-19 system, has an 1,800 meter armored cable weighing about 4.5 tons. By means of the onboard receiving equipment and a computer, sound emissions, received by the array, are analyzed in order to determine if the noise is a submarine.

In 1975, design was begun on a sonar system withan extended towed array in the TACTAS program. Presently, the following TACTAS systems are used on ships: AN/SQR-18, -18A and -19. The most modern, the AN/SQR-19, is installed on

TICONDEROGA-Class CGs, KIDD-Class DDGs, SPRUANCE-Class DDs and the OLIVER H. PERRY-Class FFGs (in the future it is planned to equip the ARLEIGH BURKE-Class DDGs with the AN/SQR-19 and to put the SQR-18 on the KNOX-Class frigates.

The capabilities of TACTASS to detect and track submarines are shown in Fig. 1. In the figure it is clear that, between the distant zones of acoustic illumination there are "shadow" zones of nondetection, which can be reduced only through conduct of simultaneous search by several vessels with the TACTAS system. In addition, towed arrays have a low bearing accuracy (2-5^0). This indicates that the dimensions of the region in which a submarine can be found, in the first illumination zone, measures approximately 10 x 5 km, the second 20 x 10 and in the third 40 x 24 km. Because of these large areas, any actions, either in tracking or attacking enemy submarines, requires further pinpointing of its location. Taking these discrepancies into account, as well as the absence of the ability to determine target range of a submarine by TACTASS, it is necessary to use helicopters to fix its location precisely. To do this the U.S. Navy uses the SH-2F SEA SPRITE helicopter (LAMPS Mk1), equipped with sonobuoys and magnetic anomaly detectors. As emphasized in the foreign press, ships equipped with TACTASS must have two helicopters on board both for solving bearing accuracy problems and for tracking several contacts with underwater targets at long distances.

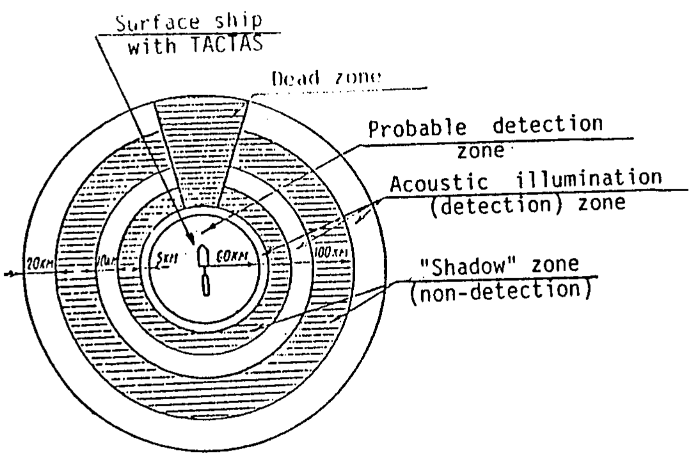


Figure 1. Detection and "Shadow" Zones With the TACTAS System

According to information in the foreign military press, the appearance in the fleet of TACTASS has essentially changed operational tactics of ASW ships. In the first place, the capabilities of escort ships to detect an underseas enemy has increased sharply. This has made it necessary to undertake new decisions concerning the organization for collection of intelligence information and command and control. In addition, the commander of such an operational group faces the problem of the disposition of TACTASS ships in order to eliminate, or at least reduce to a minimum, interference induced by noises of adjoining ships or by the operation of their active sonars.
In the second place, assignment of ships equipped with TACTASS to positions at

significant distances from the basic escort force (carrier battle group or convoy) makes them entirely vulnerable to enemy attack, especially from the air. Combat experience in the Falklands (Malvinas) Islands has shown that a similar fate awaits ships who must undertake combat missions at great distances from the primary force (1). TACTASS ships are in such positions. Nevertheless, forign military specialists consider that if the threat of air attack is not great, such ship disposition, ships with TACTASS confer a great advantage, increase the probability of submarine detection and of over the horizon targeting against surface targets.

Figures 2 and 3 show variations of ASW defense of carrier battle groups and convoys using TACTASS-equipped escorts in the outer ASW defense zone. Each carrier or convoy is screened by a variety of ASW escorts including: TACTASS ships, which carry out long range submarine search; escort ships and helicopters in the inner defense force as well as land-based patrol aircraft (in the outer ASW defense zone forward of the TACTASS ships).

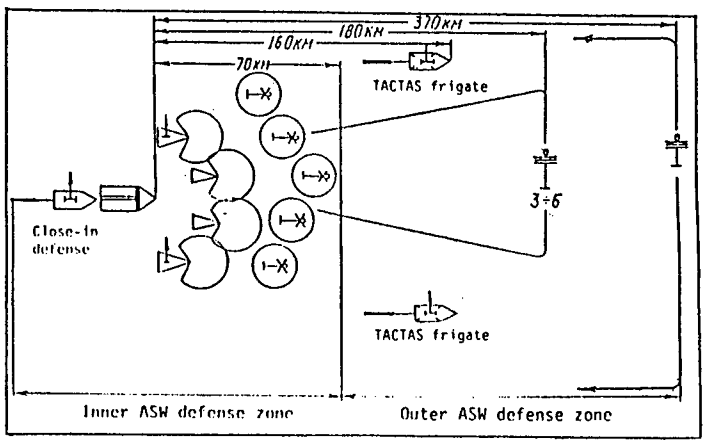


Figure 2. Carrier Battle Group Employing TACTAS Ships (Variant)

ASW ship with TACTASS search for submarines in ahead on the carrier group's track at optimal speed, which enables them to achieve the highest productivity in area search. The depth of the array is selected after consideration of specific sonar conditions in the search area. In the event a thermal layer or an underwater sound channel is present, the array can be lowered beneath the layer and on the axes of the channel which permits greater submarine detection range. Despite the fact that TACTASS works only in the passive mode, the range to the submarine can be very closely determined by the triangulation method (where bearings to the submarine are taken by several ships), or by changing ship's course to receive a second set of bearings. Since this involves a considerable difficulty intactical maneuvering of TACTASS ships, when they wish to locate precisely a submarine detected in the region, they send out a helicopter.

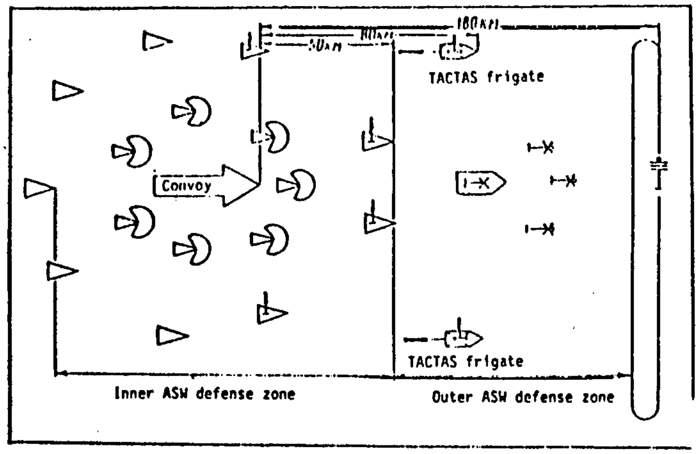


Figure 3. Convoy Defense Formation Employing TACTAS Ships.

When a submarine is detected, its coordinates are passed to the TACTASS ship and the helicopter tracks it with its own sonar or sonobuoys in preparation for attack. A second helicopter equipped with analogue sonar systems can furnish support.

Thus, operating jointly with onboard ASW helicopters, ships equipped with towed array sonar systems, as the U.S. specialists claim, have substantively increased the effectiveness of their combat potential against submarines, and (have increased) their capability at over the horizon targeting of surface combatants.

1. Two of four British DDs and FFs were sunk while carrying out radio intelligence surveillance at distances up to 220 kms from the main combatant groups.

9355
CSO: 1801/91

MEASURES TO INCREASE JAM RESISTANCE OF SHIPBOARD RADIOELECTRONIC SYSTEMS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 56-60

[Article by Capt 3rd Rank N. Lobanov and Capt 3rd Rank A. Stefanovich; "Measures to Increase Jam Resistance of Shipboard Radioelectronic Systems"]

[Text] The U.S. Navy and their partners in the Nato aggressive bloc, in planning for preparing their fleets for combat action under enemy electronic warfare (EW) conditions have placed importance on measures to increase defense against interference and jamming of shipboard electronic systems (RES).

In Western specialists' opinion, EW systems, which include radioelectronic suppression of surface ships, shore stations, carrier and tactical aviation, markedly increase Navy and Air Force combat effectiveness. Single (one time) jam transmitters, land-based, shipborne and air jamming stations and other methods of disinformation of shipboard communications and electronic systems are the most effective of these.

In considering the opportunities for use of EW suppression by the enemy, the U.S. and NATO navies have designed corresponding measures to defend their shipboard systems against interference. They are planning to undertake technical and organizational measures to counteract enemy radio and electronic reconnaissance and ensure stability of electronic systems during conditions of its suppression. Technical measures entail design, production and installation on ships of electronic systems with increased jam-resistance and security through wider bandwidths, rapid retuning of working frequencies, application of self-correcting codes, effective types of modulation of beams, and adaptive receiving and signal processing systems.

As far as organizational measures are concerned, these include training of personnel for work under conditions of intentional enemy interference, coordinated employment of EW systems and optimizing their use depending on given conditions.

U.S. specialists believe that the most effective way to protect shipboard radio communications from intentional interference is by using wideband signals, stagered use of working frequencies, adaptive receive and processing systems, variable power transmitters, jam-resistant error-detection and correction codes, and equipment which operates in millimeter wavelengths. They consider that onboard equipment for intership and long-range communications (225-400 MHz and 2-30 MHz), now installed on basic classes of ships, do not have sufficient jam-protection. Accordingly, at the end of the 1970s, the U.S. Navy decided to implement two long-term programs to modernize shipboard shortwave communications systems (HFIP - High Frequency Improvement Program) and ACCS - Advanced Command and Control System), intended to increase anti-jam capability and which take into account the state-of-the-art technical improvements in the area of EW suppression.

Specifically, in upcoming shipboard communications systems, it is intended to employ wideband signals in conjunction with adaptive receiving antennas, automated control of communications networks, pre-planned, rapid automatic reconfiguration of networks and channels as well as optimal signal mode selection depending on given conditions of interference. It is planned that these system designs will more effectively use the radio spectrum be of modular construction, and be appropriate successors to the current radio communications systems.

The integration with corresponding encryption systems (as well as those programs created for this purpose) and the application of modern modulation techniques will, in Western specialists' opinion, considerably increase the jam-resistance of new systems against prospective technical enemy means of establishing interference conditions.

Accordingly, the U.S. is currently designing a universal radio (225-400 MHz and 30-88 MHz) which must guarantee reliable communications between carrier aircraft and the ship. It will be compatible with existing radio sets of this frequency band as well as with army systems under design in the SINCGARS (Single Channel Ground and Airborne Radio System) program. In U.S. specialists' evaluation, reduction of the probability of enemy intercept and electronic suppression is possible by intermittent re-tuning of working frequencies according to pseudo-ramdom rules and regulating transmitter radiated power.

In foreign specialists' judgment, design manufacture and installation on board U.S. navy ships of new tactical radio systems will take about 10 years and cost between 1.25 and 2.5 billion dollars.

It is considered, that by the end of the 1980s, secure and jam-proof ship and aircraft communications capability will be achieved through the aid of the joint Tactical Communications and Information Distribution System (JTIDS), which operates in the 960-1,215 MHz range. In addition to mutual information exchange, it will assure identification and designation of the locations of ships and aircraft within operating groups and detachments. According to information in the foreign press, a modernized version of the JTIDS-1 system, called JTIDS-2, is being designed for U.S.Navy ships and aircraft. This is intended to increase its capacity, broaden the range of control, identification and navigation functions and apply a method of time division channel separation. The essence of the latter lies in transmitting existing data by impulses which are radiated out to each subscriber at his own specificed time, distributed according to pseudo-random rules. The speed of transmitting this information within the net is specified by information demands and can be from 600-300 (sic) kilobits/second. Accordingly, one such radio net can work no more than 512 subscribers.

Two types of terminal equipment have been developed for equipping U.S. Navy aircraft and ships. The first will be installed on aircraft carriers and the E-2C HAWKEYE long-range reconnaissance and control aircraft. In addition, they can be installed on other ships and aircraft executing specified command functions. The second type is planned for installation on carrier-based aircraft such as F-4, F-14, F-18 and A-7.

In Western specialists' view, the combination of methods of time division channel multiplexing and pseudo-random changing of the carrier frequency as well as pseudo-noise signal coding, lowers the probability of intercept of radiations by enemy electronic reconnaissance means and significantly increases its jam-resistance.

For the past 10 years, the majority of ships in the U.S. fleet have been equipped with satellite communications terminals. It is also noted that modern satellite communications systems in the decimeter and centimeter bands used by the U.S. Navy (FLTSATCOM, LEASAT, DSCAS-2), do not possess sufficient jam-resistance against enemy EW. In order to eliminate this deficiency, new principles of building satellite systems are now under design and the possibility of using millimeter band waves is being examined.

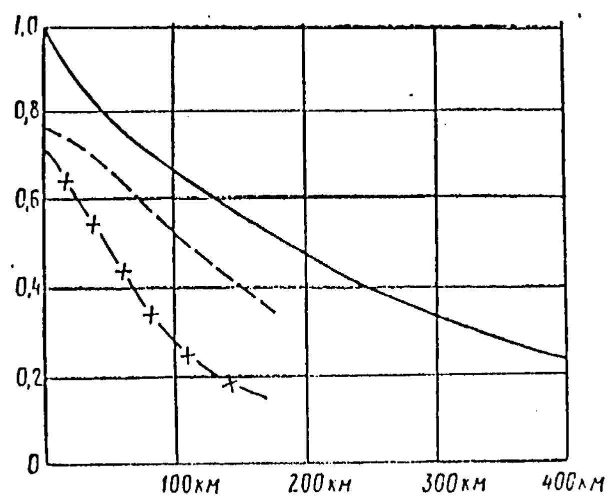
In Western specialists' opinion, establishing in new satellite communications systems means of control distributed by subscriber access (vice one net control station), onboard (satellite) processing of received and transponded signals and the establishment of inter-satellite communications links will considerably increase the jam-resistance of satellite communications channels.

As reported in the foreign press, satellite links in the millimeter band characteristically have wider frequency bands and allow a substantial increase in jam resistance and communications security through the use of wideband signals. Receiving and transmitting shipboard antennas and satellite transponders will be of reduced size and at the same time will ensure the capability of forming narrow beams which will increase the concentration of radiated power and reduce the probability of intercept of radiations by the enemy.

According to information in the foreign press, in the 1990s, U.S. Navy ships are scheduled to receive MILSTAR satellite communication terminals, which will operate in the millimeter and centimeter bands. "Ship-satellite" communications will be on 44 GHz and "satellite-ship" communications on 20 GHz. Each satellite will have 50 millimeter and 4 centimeter channels for relaying data and telephone information. To increase jam resistance, the use of wideband signals and frequency shifts, according to pseudo-randum patterns within a 2-GHz range, is planned. A phased array antenna is planned for the satellite. U.S. specialists believe that in this way countering intentional interferrence will become possible by means of a signal radiated directly at the source of interference, which, to a considerable degree, will complicate suppression of the "ship-satellite" link in the MILSTAR system.

In recent years, considerable interest has grown among foreign specialists in the use of meteor communications. This is shown by the fact that the electronic industry is familiar with the production of microprocessers which are one of the basic elements of such a communications system. As reported in the foreign press, possibilities are now being examined as well as the expediency of placing corresponding equipment at shore stations,in aircraft and in ships.

Foreign specialists point out that the peculiarities of signal propagation, in conjunction with random charactor of meteor appearance, assures a high degree of security and jam resistance of communications. Fig. 1 shows the theoretical and experimental relationships, reflecting variations in the probabilities of detection of signals from an intercept site at various distances from the point of reception of the meteor communications. In assessing the jam resistance of such a system, Western experts have noted that it is relatively easy to suppress these signals if the distance of the interfering station does not exceed direct visual range. If the interfering station would be situated at a distance outside visual range, effective suppression is sharply reduced.



—— Theoretical relationship
----- Theoretical relationship at 46 MHz
-x-x- Experimental relationship at 92 MHz

Figure 1. The Probability of Detecting Meteor Communications Radiations by Intercept Stations.

Insofar as surface waves in the shortwave band ensure relatively stable communications for 200-400 km, foreign specialists consider is expedient to apply meteor communications to distances of 400-2,000 km.

Assessing the prospects of the employment of shipboard communications resources, foreign specialists point out that the most important commands, reports and control messages will be transmitted on jam-proof satellite communications links or on shortwave communications channels, operating in increased jam-proof regimes. Less important and daily information will be transmitted on routine shorwave channels or on decimeter satellite communications links.

In recent years, foreign specialists have paid considerable attention to increasing jam-resistance of shipboard radar systems. They believe that technical means of defense against interference can be effected in various system and structural blocks: the antenna structure, the transmitters, and the signal processor subsystems. In addition, they note the possibility of enhancing jam resistance through linkage of a ship's separate radars and electronic surveillance systems into a single system for interpreting and evaluating the tactical situation.

Among the effective measures of defense against intentional interference which could be accomplished in the antenna subsystem are: output level reduction, suppression and balancing of side lobes of the directional radiation pattern and use of adaptive antennas.

The basic methods for reducing the side lobes of the the radiation pattern of a radar antenna are selection of a corresponding rule of pole distribution in the antenna opening, application of directional radiators, elimination of marginal effects and so on. As noted in the foreign press, the level of side lobes in shipboard radars is 30-40 db relative to the main lobe of the radiation directional pattern, which does not assure the necessary jam-resistance in conditions of intentional interference by the enemy (see Fig. 2).

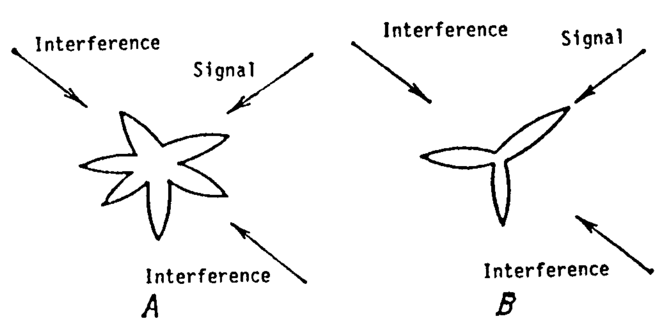


Figure 2. Formation of a Directional Pattern of an Adaptive Antenna Under Interference Conditions.

A - Radiation Pattern Before Adaptation
B - Radiation Pattern After Adaptation

This situation is conditional on the application in the radar set of a system for artificial suppression of signals appearing in the side lobes. However, one of the most effective of the prospective methods is the use of adaptive systems based on the phased array radar antenna. In foreign military specialists' view, one of the principal reasons for shifting from normal antennas with mechanical scan to phased array radars with electronic scan is the possibility of adaptive control of the radiated pattern which permits, apart from a survey of the area according to a given program, formation of gaps in a multibeam pattern toward the source of the intentional interference. Along with that, Western specialists point out that one of the shortfalls of such antennas is the impossibility of achieving the necessary jam-resistance while tracking targets collocated with the interference source. It is said, as well, that adaptation time (time necessary to form gaps in the direction pattern in the direction of the interference source) takes routinely from several tens of microseconds to a few milliseconds. The exact significance of adaptation time is determined by the actual conditions of the interference situation (quantity and power of the jamming source) as well as the structural peculiarities of the adaptive antenna itself.

To counter narrow band jamming, radars in modern ships use supression filters, which filter out of the receiving channel band portions of the particular spectrum affected by the action of the interference. These filters, in conjunction with digital signal processing systems, drive down the interference level by 30 db in frequency bands up to several MHz wide. In the future, through use of processing systems on surface acoustic waves, it is hoped to expand the frequency bandwidth up to 100 MHz. Among prospective measures to increase radar jam-resistance through processing of received signals, foreign specialists include transverse filters, which tune automatically and cut out the spectrum of interfering signals. It is noted that this reduces demand for a dynamic band of successive processing stages.

As observed in the foreign press, one effective method of defense against active interference is use of wideband signals and signals with staggered frequency emissions from pulse to pulse (or packet to pulse packets). For wideband signals in shipboard radars, one can utilize linear (or non-linear) frequency modulation and phase-coded manipulation signals. These make it significantly more difficult for the enemy to conduct radio electronic operations (SIGINT) and consequently to develop active interference of shipboard radars. Assessments, performed by Western specialists have concluded that the detection range from a SIGINT station of wideband signals is considerably less than for normal pulsed or frequency staggered emissions. Fig. 3 shows the signficance of the signal level at the SIGINT station depending on the radar range and on several technical characteristics of both the SIGINT site and the radar. Tests of jam resistance questions of wideband signals conducted overseas have shown that when wideband signal radars suppress emissions, the enemy must create interference in a wide frequency band, operating with a radar with normal pulsed signals, he can employ interference targeted at a specific frequency.

Foreign specialists have evaluated the jam resistance of various signal modes during suppression of radar side lobes by an interference station located 180 km away. Emitted power of the latter was 1 kW, antenna enhancement coefficient was 16 db and the radar range was 350 km. With suppressed radar operations, emitting simple pulsed signals, detection range was decreased to 49 km and when using wideband radar signals, up to 196 km.

For the present and the future, protection of shipboard radars from jamming will be afforded by the use of several receiving channels (linear, logarithmic, etc), various modes of power adjustments as well as pulse repetition and pulse length frequencies.

In recent years, much work has gone into design in the U.S. of millimeter and centimeter wave radars, which, in the estimate of specialists, possess higher security and jam resistance in comparison with existing sets. Thus, following extensive tests, a radar set, operating in the 15-20 GHz band, was developed and installed in warships of the U.S. Navy and other NATO navies, as a component of the anti-aircraft installation VULCAN-PHALANX.

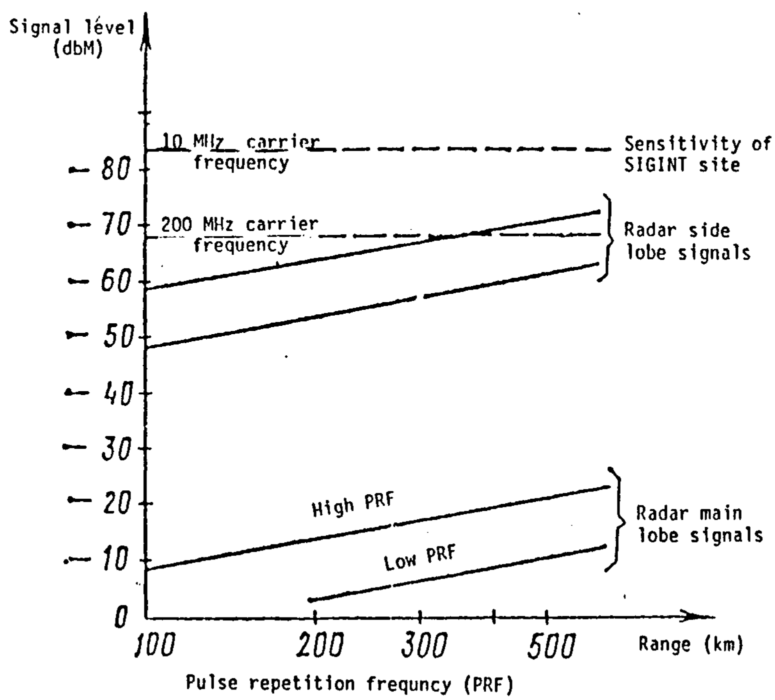


Figure 3. Signal Levels Arriving at SIGINT Site at Varying Distances from the Radar.

Methods of linking shipboard radars into networks received advanced development. Thus the AN/SYS-1, an automated system of processing radar signals, processes data, received from various radars located on the same ship, through an interlinking device. Signals are received in the SYS-1, where they undergo correlation processing and end up by formulating a single target notation. This system establishes for each radar a detection threshold and a search area, and also controls the process of automatic target tracking. Systems tests of the AN/SYS-1 in conjunction with a string of standard shipboard radars have pointed out its high jam resistance, dependent upon the operation of shipboard radars at various frequencies. To further increase AN/SYS-1 system effectiveness, it is planned to accomplish system wide processing of signals received both from shipboard radars as well as from SIGINT stations.

In Western defense specialists' view, the most effective defense of shipboard radars against interference might be achieved by executing several of the following measures: organization of successful surveillance of enemy forces and countering his intelligence collection systems; optimal use of electronic warfare systems depending on given conditions; timely detection of organized interference carriers; and, tight interoperations between forces and ship group resources with constantly operating systems of observation of the theater of military operations.

One of the means of countering enemy SIGINT operations, in foreign experts' view, is reducing the number of different types of shipboard radars. It is said that the equipment of warships in the U.S. Fleet must include the AN/SPY-1 multipurpose radar and two each of the two- and three-dimensional air search radars (respectively AN/SPS-40 and -49 and AN/PS-48 and -52), surface search radars (AN/SPS-67 and -55) as well as the AN/SPS-58 and -65 low flying target detection radars. In Western defense specialists' opinion, equipping ships with various classes of single-type radars complicates the enemy's assignment of main targets in an aircraft carrier group (of ships) which in turn reduces his firepower effectiveness.

Judging from the material in the foreign press, if at one time primary attention was paid to destroying the operations of separate components of the enemy's command and control systems (Western experts include intelligence systems in command and control), then today the U.S. Navy is studying the possibility of demonstrating counteracting the enemy's command and control system in its entirety.

Foreign specialists point out that a carrier battle group must resolve electronic warfare problems in stages. During preparation and when first entering its assigned area, it is necessary to ensure security and disinformation of the enemy in conjunction with the battle group's limited use of its EW assets. It is said that U.S. Navy aircraft carriers now are equipped with the AN/SSQ-82, which permits them to establish an operating regime and an emission level for shipboard EW systems related directly to radio wave propagation conditions and the tactical situation. The selection of a system of optimal bands for working frequencies and radiated power of EW systems assures an enhancement of battle group security.

As the group approaches a combat action zone and within the detection range of enemy forces, the accent shifts to conducting radioelectronic surveillance and suppression of enemy command systems, as well as assuring the stable operations of its own EW systems under interference conditions created by them.

Realization of the above listed courses for improving the jam and interference resistance of shipboard EW systems, as underlined in the foreign press, will substantially increase the combat capabilities of ships of the fleet inaccomplishing their missions.

9355
CSO: 1801/91

JAPANESE NAVY GUIDED MISSILE FRIGATES

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 60-62

[Article by Capt 1st Rank Yu. Yurin; "Japanese Navy Guided Missile Frigates"]

[Text] The Japanese government, being nudged by the militaristic circles of the U.S., continues to strengthen its naval forces, and in so doing is paying special attention to development of surface combatants, especially escort forces.

Among the escort ships entering the fleet in the naval districts (9 separate divisions, 23 ships), the most modern are three FFGs (DE 226 ISHIKARI; and two of the YUBARI-Class - DE 227 YUBARI (Fig. 2) and DE 228 YUBETSU) of the 35th separate division, deployed at the Ominata Naval Base. They are designated primarily for ASW. At the same time, their armament permits them to strike at surface ships and secure effective self-defense from enemy air attacks. For defense aginst antiship missile, it is planned to install one 20-mm AAW complex VULCAN-PHALANX in the near future.

Construction of these FFGs, as indicated in the foreign press, has been a distinct stage in the evolution of Japanese naval command views on development of ships of this class. Construction of these ships followed a considerable amount of scientific research and development of construction techniques. Throughout the entire process of construction they were watched carefully by a group of service control personnel at the construction wharves of MITSUI in Tamano, HITACHI-ZOCEN in Maisura and SHUMITOMO-ZHOKOSEN in Ugara where construction was done. In a special training center a complex of trainers and simulators of various ship systems was constructed to train the crew in their exploitation and survivability.

The first guided missile class ship of the Japanese Navy was the DE226 ISHKARI (the program was designed with the aid of U.S. specialists), which entered the battle fleet in 1981. Follow on FFs of the YUBARI-Class (transferred to the fleet in 1983 and 1984) were very similar in architecture and hull construction to the ISHIKARI, and in armament and equipment were identical to it. In fact, they are a modification of it. They are flush deck with a superstructure and central element, with a significant coefficient of volume in the waterline surface area, including the bow section. Almost along its

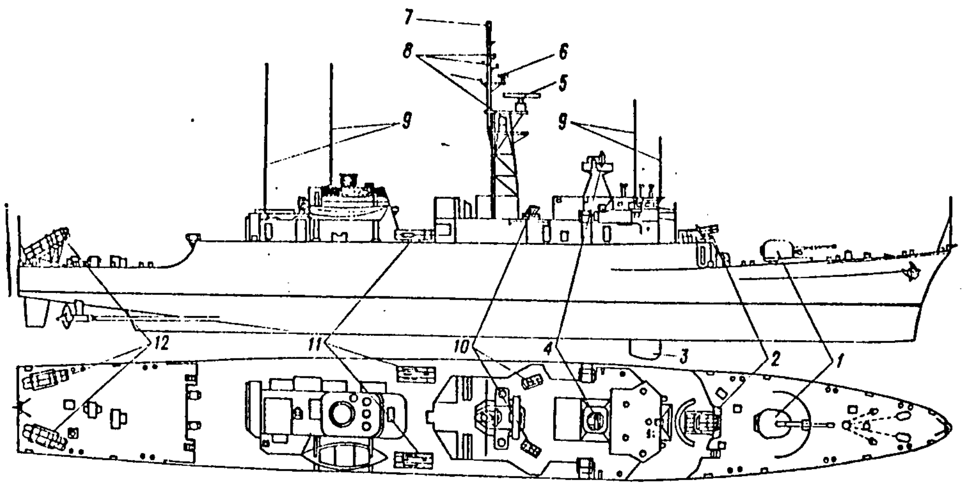


Figure 2. YUBARI-Class FFG DE228 YUBETSU

1. MK75 COMPACT OTO MELARI 76-mm gun.
2. TYPE-71 375-mm 4-barrel BOFORS aheadthrown ASW missiles.
3. AN/SQS-36DJ hull-mounted sonar dome.
4. TYPE-79 fire control radar (GFCS-2-21B).
5. OPS-28 surface search radar.
6. OPS-19 navigation radar.
7. OLR-9B radar intercept antenna (to detect operating radars in guided anti-ship missile warheads.
8. NOLR-6C radar and radio electronic intercept antenna.
9. Communications and navigation antennas.
10. MK36 6-barrel CHAFF launcher.
11. TYPE-68 MK32 324-mm torpedo tube installation.
12. 4-barrel HARPOON anti-ship guided missile launcher.

whole length, the hull is double-bottomed, and in between are located fuel, oil and water tanks. In the hull and the superstructure, there are virtually no portholes. The ships are equipped with an active roll damping system with side rudders, as well as a sewage flushing and cleaning system. All interior compartments are air conditioned. Ship control (power and steering) as well as the power plant has been automated which has enabled them to reduce the crew size.

Japanese FFGs have a combination power plant, including one gas turbine, OLYMPUS TM 3B (built under license by the Japanese company, Kawasaki Dzyukoge) for full speed and a diesel 6DRV (Mitsubishi Dzyukoge) for cruising. They work through a disconnecting clutch on the main first stage reduction gear with a power splitter and then with the use of two second stage reduction gears on two shafts with four bladed helical variable pitch screws about 2.6 m in diameter. Maximal burst power of the TM3B turbine is 28,000 hp; maximum sustained power 22,600 hp. The turbine is installed in modular form, consisting of a gas generator, its air intakes and noise isolation casing; and a power turbine with its casing and gas exhaust stack. The diesel's maximum power is 4,650 hp (it is also modularly installed). Modules are mounted on cushioned mounts to increase strike and explosion resistance. The automated control system of the main power plant permits control of the gas turbine and diesel in a joint or singular operation with the propellors. The entire propulsion unit is situated in two compartments.

Technical combat capabilities of the Japanese FFG are displayed in the Table.

Japanese FFG Basic Military Characteristics

Characteristics	ISHIKARI	YUBARI	DE229 (planned)
Displacement, t			
Standard	1,290	1,470	1,900
Full load	about 1,500	1,690	unknown
Principal Measurements, m			
Length	85	91	104
Beam	10.6	10.8	12.5
Draft	3.5	3.6	3.8
Propulsion Plant Type	CODOG	CODOG	CODOG
Gas Turbine	TM3B	TM3B	SMIA (2)
Diesel	6DRV	6DRV	S20U (2)
Propulsion Power, hp			
Gas Turbine	22,500	22,500	about 30,000
Diesel	4,650	4,650	about 12,000
Speed, kts			
Full Speed	25	25	27
Economic (Cruising)	10-12	10-12	unknown
Crew Size	90	95	132
Armament*			
Missiles	HARPOON 2x4	HARPOON 2x4	HARPOON 2x4 RAM ASROC 1x8
Guns	MK75 76-mm 1x1	MK75 76-mm 1x2	MK75 76-mm 1x2
Torpedoes	324-mm tubes "68" 2x3	324-mm tubes "68" 2x3	"68" 2x3
Bombs	375-mm BOFORS ASW rockets 1x4	375-mm BOFORS ASW rockets 1x4	375-mm BOFORS ASW rockets 1x4
Chaff Launchers	MK36 2x3	MK36 2x3	MK36 2x3

* Quantites of missiles and gun installations, the number of launchers and tubes in them as well as the number of torpedo tubes and installations is indicated by a multiplication sign (x).

Japanese FFG Basic Military Characteristics (continued)

Characteristics	ISHIKARI	YUBARI	DE229 (planned)
Radioelectronic Equipment			
Air Search Radar	none	none	unknown
Surface Search Radar	OPS-28	OPS-28	unknown
Navigation Radar	OPS-19	OPS-19	unknown
Fire Control Radar	"79" GFCS-2-21B	"79" GFCS-2-21B	GFCS-2 or -3
Sonar	AN/SQS-36DJ	AN/SQS-36DJ	OQS-X
SIGINT and EW Stations	NOLR-6C	NOLR-6C	NOLQ-X
Projected Systems			
AAW - VULCAN-PHALANX	MK15 20-mm 1x6	MK15 20-mm 1x6	MK15 20-mm 1x6
EW Station	OLT-3	OLT-3	unknown

* Quantites of missiles and gun installations, the number of launchers and tubes in them as well as the number of torpedo tubes and installations is indicated by a multiplication sign (x).

At first it was intended to construct 5 YUBARI-Class ships, including the latest three in accord with the Japanese five-year ship construction plan (1983-87). Authorization for the first was approved in FY-83, however the money was not made available. Ultimately, in view of their high cost and the insufficient response to the requirements, construction was cancelled and a new project was begun. According to the current five-year plan (1986-90), it is planned to build six new DE229-Class FFGs of 1,900 ton displacement. Resources for the first two ships were in the FY-86 budget. The lead ship is expected to be in the fleet in 1990. The other four ships will be for construction in 1987 and 1989.

In contrast to the existing ships, the new Japanese FFGs will be equipped with the ASW ASROC missile (in lieu of the RBU BOFORS) and the AA system RAM jointly designed by the U.S., Germany and Denmark. The final decision on installing the RAM on the DE229-Class FFGs will depend on the result of field tests.

Thus, judging from information in the foreign press, in the next 4-6 years, the FFG class in Japan's Navy will be further developed and the entry into the fleet of those under construction will greatly enhance its power.

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CSO: 1801/91

BRITISH NAVY WARSHIP CONSTRUCTION/SHIP REPAIR BASE

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 63-69

[Article by Capt 1st Rank (Reserve) M. Tsiporukha; "The British Navy Warship Construction and Ship Repair Base"]

[Text] Great Britain's ship construction and repair facilities, over the course of many years, have been counted by foreign specialists as an important integral part of the nation's military-industrial potential. The main ship construction and repair yards of the Navy are nationalized enterprises of this branch of the industry as are the British Admiralty naval shipyards (see the illustration for their locations within the country.)

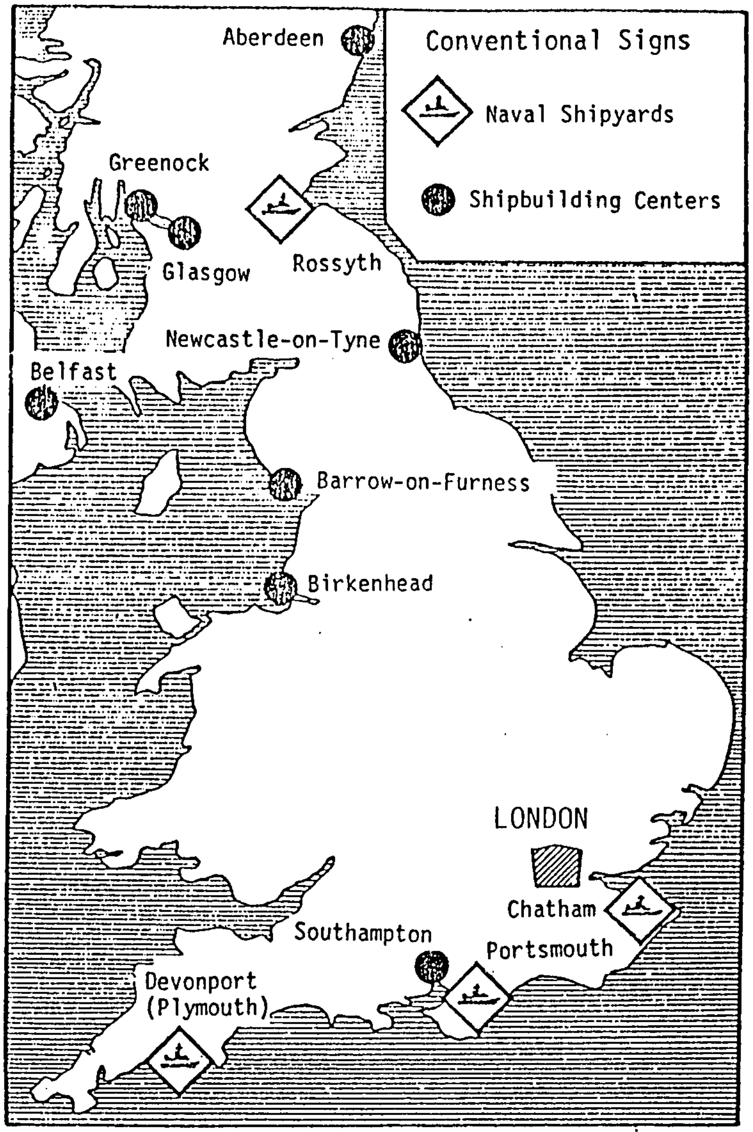
In England, nationalization of the ship construction industry took place in 1977. The responsibility for about 100 nationalized heavy industries and their affiliated firms, involved with shipbuilding, shipbuilding machinery construction and ship repair was transferred to the staff of private enterprises of the corporation "British Shipbuilding." Over all 32 shipyards were included in the organization.

Among those nationalized were three companies involved only with military ship construction: "Vickers Shipbuilding Group" (since 1985, called "Vickers Shipbuilding and Engineering"), whose plants are located in Barrow-on-Furness; "Yarrow Shipbuilding," in Glasgow; and "Vosper Thornycroft," in Portsmoutn and Southampton; as well as three firms which build both military and commercial shipping: "Cammell Laird Shipbuilders" (Birkenhead); "Swan Hunter Shipbuilders" (Newcastle); and "Scott Lithgow" (Greenock).

Within the framework of "British Shipbuilders," a number of private construction factories and several state-owned companies continue to operate. For example, one such group is "Harland & Wolff," in Belfast, Northern Ireland. Along with purely shipbuilding enterprises, 14 important shipyards, 7 of which are involved only with ship repair, and the remaining with repair and warship construction were incorporated into the umbrella company.

Finally, to improve the yards' activities, "British Shipbuilding" undertook a fundamental reorganization of their structure and created within this framework five specialized sections with substantive control organizations:

combatant ship construction; transport ship construction (with three components--large, composite and small dockyards); combatant and commercial ship repair; construction of technical means of ocean utilization (drilling platforms, support ships, etc); and ship machine construction. In the course of the reorganization, ten unprofitable dockyards were closed and a similar number of shipyards were mothballed. In the new organizaiton were left three main leading shipyards for warship cosntruction and 14 for construction of commercial ships, disposed in 28 continually operating dockyard areas. As a result of these curtailments, the number employed, at the beginning of 1984, stood at 60,000 workers.



Locations of British Naval Shipyards and Principal Shipbuilding Centers

The government of conservatives, being guided by the interests of heavy monoplistic capital, decided to denationalize 7 of the most profitable yards, either fully or partially engaged in warship construction: "Vickers Shipbuilding Group," "Yarrow Shipbuilders," "Vosper Thronycroft," "Cammell Laird Shipbuilders," and "Swan Hunter Shipbuilders." According to "British Shipbuilders" annual report for 1984, these 7 yards would be turned over to the private sector in the course of the next 18 months.

The construction shipyard of "Vickers Shipbuilding and Engineering," in Barrow-on-Furness, is the leading yard for combatant ship construction in Great Britain. It specializes primarily in building SSBNs, SSNs and heavy surface ships. The company also operates a construction bureau and a test basin in St. Albans (Hartfordshire). A class of SSNs, the aircraft carrier INVINCIBLE (lead ship in a series of three), DDGs both for the RN and for export and diesel submarines have been built at its dockyards. The company employs 8,000 workers.

By the end of the 1970s, the shipyard had five construction piers from 130-327 m long. Currently a new complex is being developed assemble SSBN hulls, to include simultaneous installation in them of their equpment, then subsequent launch and finishing work.

The first stage of development of the complex, almost completed by the summer of 1983, concluded in construction of a new plant for manufacturing and processing hull component constructions as well as enlarging the existing assembly plant. Execution of the work at this stage laid the foundation using the latest technology for continuous production of hull sections from which the submarines will be assembled.

The second phase includes construction of a covered launchway, a ship elevator and a wet dock. The covered launchway will be 260 m long, 58 m wide and 51 m high. In a three story addition there will be production components, storage, administrative-management and living components.

Within the launching way, in each of the side lines will be two stations for assemblying the hulls of 4 SSBNs. Six bridge cranes (two each with capacity for 150, 30 and 15 tons) will be installed. The building height permits the cranes to move above the raised extended structure of the submarines.

The technological cycle of operations of the complex, according to foreign press writings is planned to be accomplished in the following manner. SSBN hull sections, being delivered on transporters from the assembly yards, weighing 250 tons, will enter via the end doors in the central line of the launchway. Two 150-ton cranes, working jointly, will transfer the section to the initial position on the right or left aisle and place it on a trolley, which will be disposed along longitudinal rails. The section will be filled with equipment and systems to the maximum degree possible and then will be joined and welded to other sections.

Construction ends at the final line position, after which the newly built ship, on the trolley, is moved along a system of continuous rails into the central line and travels along a longitudinal rail line through gates to the platform of a 24,300-ton ship elevator (162 x 22 m). Lifting and lowering of the platform is done by 108 electrical windlasses with a capacity of 225 tons each.

Following launch, the SSBN is towed away to a finishing wet dock, which can accommodate two ships. The wet dock is served by a 40-ton capacity gantry crane. According to several pronouncements of the foreign press, the submarines can make test dives in the wet dock.

The launching way must be completed by the end of 1986, and the ship elevator by the middle of 1987. the complex in full must be ready for full operations by the end of 1987. It is expected that the first ships to be built here will be 4 SSBNs, equipped with the TRIDENT-2 missile bought from the U.S. According to the foreign press, orders for construction of the lead ship of this series were issued on April 30, 1986. Construction itself is scheduled to start in 1988, and finish in 1991. In 1992, the lead SSBN is expected to join the active fleet. Not to be excluded, multi-purpose SSNs will also be constructed simultaneously in the new complex. The approximate cost of the new complex is 185 million dollars.

"Yarrow Shipbuilding" is engaged in basic warship construction and manufacturing of ship's boilers. The production capacity of the ship construction yards in Glasgow permit construction of ships and vessels up to 160 m long. They employ about 5,000 workers. The yard specializes in construction of the BROADSWORD-Class FFGs. In 1982, its management began a period of modernization in the course of which a covered shipbuilding complex was built and a new ship elevator, "Synchrolift," was installed.

Warship construction and ship repair enterprises of "Vosper Thornycroft" which employs 5,000 persons, are located in Southampton and Portsmouth. The heaviest commercial shipbuilding yard is located in Southampton. Its modernization had been completed by the beginning of the 1980s. Three covered building docks were constructed (two 140 m and one 45 m long). A production complex has added to one of the 140-m docks. These shipyards build SHEFFIELD-Class DDGs and FFGs.

Ship repair facilities include three dry docks and two slipways with a capacity of up to 1,500 tons. One of the docks has a useful length of 350 m and is one of the largest ship repair facility in the country.

Production equipment of the Portsmouth shipyard includes 60-m docks and slipways with a lift capcity of up to 400 tons. In the course of modernization, one of the covered docks was doubled in length (up to 120 m). This covered slipway is also equipped with a bridge crane of 15-ton capacity and with three rail systems for transportating constructed hulls to the launch site. Next to this, a building has been erected for production facilities, administrative and mangement functions and living spaces.

In Portsmouth, minesweepers are build as well as patrol cutters and air cushion vessels. In 1972, WILTON, the first minehunter-sweeper in the world made of fiberglass, was launched here.

"Cammell Laird Shipbuilders" operates one of the largest dockyards in the country (in Birkenhead). In recent years its modernization has been accomplished, during which the docks and a hull plant were re-equipped; a continuous line for assembly of ship cosntruction was developed and very modern production equipment was installed. At the present time, in the shipyard there is a covered building complex 145 x 107 x 50 m. It is dedicated fully to the production of warships and auxiliaries. The company has a rich background in combatant construciton. In Birkenhead's shipyards back in 1955, the carrier ARK ROYAL was built and the following year, SSBNs, SSNs, a series of DDGs and fleet tanker/replenishment ships.

"Swan Hunter Shipbuilders" operates four warship construction and ship repair yards employing 8,800 persons. The largest of these are situated in Wallsend and Newcastle-on-Tyne. These yards are capable of building large tonnage vessels and large displacement warships. The shipyards at Wallsend built between 1976 and 1984, ASW Carriers of the INVINCIBLE-Class, ILLUSTRIOUS and ARK ROYAL, and at the present time an automated program management and ship construction system was installed using computers designed in 1981 by the British scientific research association of shipbuilding.

According to the foreign press, thanks to the widespread introduction of new methods of managment and production improvement, the company is planning to reduce warship construction time and to lower their construction costs. Thus, at the Wallsend yard in March 1984, the 5th and 6th frigates of the BROADSWORD-Class, SHEFFIELD(1) and COVENTRY, were laid down. The planned construction time of each of them is 4.5 years from the order date, while at the same company yards construction of Project 42 DDGs was taking on the average 5 years and 5 months. Economies received were equal to 10 per cent of the value of each ship, amounting to about 15 million pounds sterling.

Reductions in construction time are achieved, in part, by the use of combined brigades of joint welders, electricians, machinist-installers, and other specialists. On the open docks, they employ moveable awnings which improve working conditions and facilitate speeding up work tempo.

Thanks to the utilization, during planning and manufacturing of piping, of a system of volume production borrowed from the aerospace industry, it was possible to reduce the proportion of components modified during assembly of shipboard piping from 8 to 2 per cent. This is substantive, if one considers that about 21,000 sections of piping are required for one BROADSWORD-Class FFG.

The methods of automated planning and production management, using computers, has allowed the company to improve the process of pre-saturation of sections and blocks of hulls of ships under construction.

Speeding up of construction tempo was also facilitated by using, during the final stages of construction, specially equipped barges, allowing the fitting out ship to be moved without interuption by supplying it with electricity, warm water, compressed air, etc.

According to reports in the foreign press, as early as 1984, at the "Swan Hunter Shipbuilders" shipyards, worker productivity in fabricating hulls had increased by 16 per cent and in electrical work by 20 per cent. The company has as its goal an increase in worker productivity, by 1988, of 5-per cent in comparison with 1983 figures.
Warship construction and ship repair yards of "Scott Lithgow" are situated in Greenock and Glasgow. In Greenock there is also a marine engine factory. The ship construction wharves in Greenock include seven building docks (the largest of which is 200 m long). They can build there ships of 50,000 tons displacement, surface warships and diesel submarines. The shipyard has filled export orders for construction of OBERON-Class diesel submarines.

Military cutters of various designations for the Royal navy and for export are launched at the yards of "Hall Russell" (Aberdeen), "Brooke Marine" (Lowstoft) and others.

One company which did not join "British Shipbuilders," is "Harland and Wolfe" which operates the largest shipbuilding yard in Great Britain in Belfast (N. Ireland), where 7,000 workers are employed. It has considerable experience in military ship construction. During the Second World War and in the first post-war years, these yards build aircraft carriers, destroyers and frigates. The yard has a dry dock for production of ships of up to 1.2 million deadweight tons. In recent years the dock has been used mainly to construct floating bases and ships to supply ocean drilling platforms. At the end of the 1970s, and beginning of the '80s, a considerable amount of work was accomplished in modernization by replacing much of the production equipment and crane network.

Four large naval yards in Chatham, Portsmouth, Devenport (Plymouth) and Rossyth belong to the Admiralty. During WWII cruisers and submarines were built at the first three and in the post-war years, frigates and diesel submarines. Now these yards do only modernization, re-equipping and technical servicing of RN warships, including SSNs. They operate 37 drydocks (9 of which are longer than 200 meters) and 5 floating docks (lift capacity up to 13.5 tons), serving all classes of naval ships in the country.

The "Chatham Naval Shipyard" for SSN repair utilizes two drydocks and the piers situated alongside. Between the docks are production, adminsitrative-management and housing sections both for the crew of the submarines and for storage.

For electrical power to the docks and the SSNs themselves, while their own power plants are off the line, electrical service is provided to the docks from two remote electrical substations.

The shipyard had designed the technology for replacing nuclear fuel (active material) as well as the complete replacement of the reactor core. In this process the reactor core, when being offloaded, is cooled by special means. The cooling continues until it is placed into a flooded water reservoir. This method of replacing the nuclear core is used primarily when it is necessary to make structural changes in the reactor.

The NAVAL SHIPYARD IN ROSSYTH conducts major repair and modernization of SSBNs, including recoring the reactor. In accordance with a plan for shipyard preparedness to modernize SSNBs, by 1980, considerable work had been accomplished in reequipping the ship repair complex (approximately 12 million pounds Sterling were spent). At this yard repair and modernization of 24-26 months' duration is carried out on British SSBNs. The example of the SSBN RESOLUTION demonstrates this kind of work. In October 1982, the ship arrived at the yard for a routine repair and her 3rd (and last) update. During the overhaul, plating explosed to corrosion was replaced along with components of the ship's framing. It was announced in the foreign press, that, thanks to the latest modernization of her auxiliary motor systems, the ship's noise had been reduced by 20 per cent. The combat information post and missile fire control systems had also been significantly modernized. All the SSBNs were re-armed with the new British-made multiple warhead missile under the SHEVALIN program. In October 1984, the SSBN REPULSE arrived at the yard for a 2-year, 122 million dollar overhaul.

Repair and technical servicing of the 4 TRIDENT-2 SSBNs scheduled for construction will also be done at the Rossyth yards. Expansion, including construction of two covered docks and other manufacturing activities, is planned to start in 1990. Yard modernization will last no less than 5 years and will cost 215-245 million dollars.

Between 1972 and 1978, reconstruction of the Naval shipyard in Plymouth (Devonport) was accomplished in order to supply repair, modernization and technical services to the LINDER, AMAZON, and BROADSWORD-Class FFGs. Parallel with this, considerable work was done to develop a repair complex for SSNs. The expenditures for this fundamental work for those years was about 66 million pounds Sterling.

The particularity of this shipyard lies in its inside sealed, locked basins with their repair wharves and drydocks. Because of this, a constant water level is maintained in the basins even during daily ebb and flow of tides which can differ by 6 m. During reconstruction, the entrance floodgates were reequipped, the pierage length was increased and basins and dry docks were deepened.

New cranes with 10- and 50-ton capacity have been installed on the repair piers. On the basin piers, there is a shore-based test facility for shipboard generators, by which it is possible to test simultaneously three 1-MW generators at 75 per cent load or two such generators at full load.

One of the most significant new structures in the frigate repair and modernizaiton complex is the slipway, covering three dry docks. It is structured as a single block with a front section containing manufacturing shops, stores, administrative spaces, a computing center and living spaces, including spaces for the crews of the ships in dry dock. The slipway is 150 m long, 165 m wide and 43 m high. Its size permits docking frigates without demasting them.

The hoisting gates are 25 m wide and 40 m high and consist of four horizontal panels about 10 m high, each of which moves in a separate direction, and can be independently opened and closed automatically. Such gate construction has made it possible to avoid installation of ventilation compartments, since one of the panels can be used as a ventilation curtain.

Some of the construction particulars of the dry docks, following their modernization, are of interest. Each of them is similar in construction and are the same size: 134 x 19.8 x 11 m with a 7-m water depth above the keel blocks. The lengthwise slope of the bottom is 1:300 with a transverse slope of 1:50, which assures a rapid outflow of water. Special depths are available for removal and installation of bottom-mounted sonar domes.

On the upper walls of each dock there is a channellized collector with enclosed flexible hoses to handle the outflow from the ship's sanitary system, which enables these systems to continue to function while the ship is in dry dock. There are also pipes for offboard water which are used for flooding compartments for test purposes and to furnish water to ship systems in case of emergency. Special installations are used to test systems for transferring loads enroute to sea and other lifting structures in the docks and on the basin piers.

Movement of the ships in the basin, as well as during entry and exit from the dock, is accomplished with the use of seven capstans (each of 16-ton capacity), roller chocks and dockside bitts, and in the docks, by means of winches and traction trolleys.

The dock walls and the basin piers are equipped with connection points for delivery of power, air, steam and return of condensate for ships under repair. Oxygen and acetylene for safety reasons are delivered to the piers by separate channels. Pipes are installed for delivery to the ships of fresh water, offboard water for firefighting systems and distilled water.

On all the logitudinal walls of the three docks are installed semi-gantry cranes of 20-ton capacity, moveable along the entire length of the docks. Each dock is served by a radio-controlled telpher, which moves along the axis of the dock under the slipway roof. Using it, it is possible to install antennas and other equipment on ships' masts.

The larger part of the slanted roof of the slipway is made of translucent plastic sheets. In combination with glass skylights, such construciton of the roof guarantees interior lighting similar to natural. In addition, there is electric lighting inside which permits work during hours of darkness.

In the docks of the new structure, they use rapid assembly, moveable basin platforms of various types which reduces docking time and lowers labor costs. When the work involves heavy contamination, sections of the ship and approaches to it are specially cordoned off and the exhaust flows into closed containers. Sandblasting work is done only with vacuum equipment. Wide use is made of high pressure water cleaning of hulls.

When the work is the dock entails use of toxic dyes, a temporary exhaust shaft is set up using a portable exhaust fan to shunt dirty air into the atmosphere.

Painting work is usually done on the night shift with a regulated inflow of fresh air through the gates.

Although, after modernization, these docks were designated mainly for repair and docking of FFGs, it is anticipated that if need be they would dock submarines in them. For this purpose special supporting apparatus in the form of docking trolleys have been manufactured and are stored in various forms at the shipyard.

The Royal Navy estimates that doing repair work in the slipway has great economic advantage. According to observations over many years, ship repair in the open air at the country's yards is not possible 70 days a year.

The foreign press has noted that as a result of modernization of the Devonport naval shipyard, the duration of heavy repair and modernization work on FFGs has been reduced by more than 70 days. The time for a preventive maintenance repair for LINDER-Class FFGs was reduced from 5.5 to 4 weeks and repair and modernization of a medium size, from 8.5 to 5.5 months. Reduction of labor expenditures, according to shipyard specialists, consisted, on the average, of about 28,000 man hours per ship.

The Admiralty formerly operated the ship repair yard on Gibraltar, with 3 dry docks of various sizes, where ships of 141, 178 and 230 m respectively could be docked. In February, 1984, the firm "Gibraltar Ship Repair" was formed and received this shipyard for the repair, modernization, reequipping and technical servicing of transport ships up to 75,000 deadweight tons. The transfer of the yard had been planned for an earlier period, but was held up due to the Falklands conflict, during which the Admiralty actively operated it for reequipping merchant ships and preparing them for use by the Royal Navy.

The Tory government allotted 17 million pounds Sterling for the reconstruction of the yard and upgrading its manufacturing equipment for repair of merchant ships. In modernizing dock #1, they installed the so-called "docking arms" derrick booms which move along the dock walls with working platforms; a system for hydraulic hull cleaning; new dock support structures; and systems of ship entry and exit. Systems for covering dock spaces and drainage were modernized. Seven new cranes of upgraded lift capacity were installed and a 3,000 deadweight ton barge was acquired for removal from the ship of remnants of its liquid cargo. In the future, it is planned to use this industrial activity for the repair and technical servicing of Royal Navy auxiliary ships.

1. Earlier, this name was borne by the guided missile destroyer sunk during combat operations in the South Atlantic in the Falkland (Malvines) Islands in 1982. Ed.

9355
CSO: 1801/91

ARABIAN PENINSULA COUNTRIES' PIPELINE SYSTEMS

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 69-74

[Article by Col A. Kazakov; "Arabian Peninsula Countries' Pipeline Systems"]

[Text] The wealth of the Arabian Peninsula countries, particularly the Persian Gulf states (Saudi Arabia, Kuwait, Bahrain, Qatar, the United Arab Emirates (UAE), and Oman) stems primarily from the export of oil and gas. The proven oil reserves of these countries, at the beginning of 1985, exceeded 70 billion tons. Their economies are based on oil and gas production, and the refining industry. There are sprawling complexes of modern facilities in these countries for refining oil, liquifying natural and by product gases, desalinization plants, oil shipping terminals and port facilities, and airports; they are building a network of highways and new oil and gas pipelines, and increasing their production capacity. Saudi Arabia, Kuwait, Bahrain, Qatar and the UAE are all members of the Organization of Arabian Petroleum Exporting Countries (OAPEC). With the exception of Bahrain, all of them are also members of the Organization of Petroleum Exporting Countries (OPEC).

Nearly one-fifth of all oil and petroleum products destined for the West is shipped from the ports of this region through the easily blockaded Strait of Hormuz. As western experts point out, it would be hard to overestimate the political and military reaction to any military interdiction of shipping traffic through the Strait. Former U.S. Ambassador to Saudi Arabia, John West, once remarked that if the oil supply from the Persian Gulf was cut for only six months, the U.S. would experience a depression every bit as severe as that of the 1930s. Such a danger exists as a result of the Iran-Iraq war which divides the oil producing countries of the Persian Gulf. They depend, to a large degree, on the economic stability of the West and the continuous influx of oil revenues. For these reasons, the ruling circles of the Arab and Western countries devote particular attention to maintaining the security of the oil tanker routes and building pipelines that circumvent the Strait of Hormuz by running to the coasts of the Red Sea and Indian Ocean.

Several summaries, drawn from foreign media sources, follow that describe the pipeline networks on the Arabian Peninsula.
SAUDI ARABIA occupies first place in the capitalist world in terms of oil

reserves and production. As of 1985, its proven reserves totalled over 23 billion tons, while annual output for 1984, was estimated at nearly 240 million tons and at 165 million tons for 1985. The principal oil producing areas are Abkayk, Abu-Hadriya, Abu-Safah (coastal), Berri (offshore), Gavar, Dammam, Zuluf (offshore), Al Qatif, Manifa (offshore), Mardjan (offshore), Saffaniyah, Fadili, Fazran, Kharsainiya, Khurais, Khurmaliya. The Saudis are rapidly developing their oil and gas refining industry which consists of six oil refineries (with a total production capacity of about 70 million tons per year) in the cities of Jiddha, Ras-Tannurah, Ras Al Khafji, Riyadh, Al Jubayl and Yanbu El Bahr (Yanbo).

In order to transport oil, natural and by-product gases from where they are extracted to the country's refineries and shipping terminals, there is a pipeline network (Fig. 1) which they decided to start building in 1939. It extends for about 7,000 km in Saudi Arabia and can carry over 140 million tons of oil and petroleum products annually.

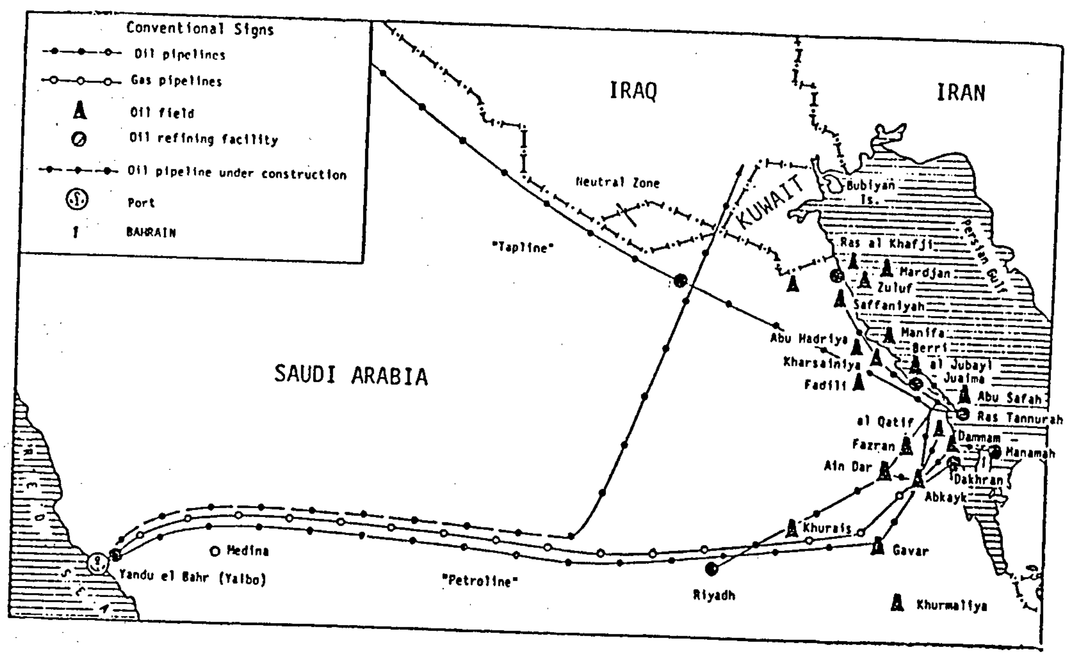


Figure 1. Location of Oil Pipelines in Saudi Arabia

One of the greatest oil pipelines on the Arabian Peninsula, the "Tapline," was placed in operation by the Saudis in 1950. It links the oil fields of Abkayk with the Lebanese port of Saida on the Mediterranean Sea, crossing through the territories of Jordan (117 km), Syria (127 km), and Lebanon (42 km). It is 1,213 km in overall length with pipe diameters of 762 and 787.4 mm. The system can carry in excees of 25 million tons of oil per year and is equipped with six pumping stations distributed over the course of the pipeline. Since it began operating there have been repeated outages. Between 1967 and 1975, there have been seven operational interruptions due to diversionary incidents and economic considerations, and the flow of oil was disrupted by Israel's invasion of Lebanon in 1982.

Saudi Arabia's other important oil pipelines include the "Petroline" which was finished in 1981. It connects the Abkayk and Gavar oil fields, located in the eastern part of the country, to an oil shipping terminal at Yenbu El Bahr on the coast of the Red Sea (150 km west of Medina). The pipeline extends nearly 1,200 km. The 1,219.2 mm diameter pipes, coated with a corrosion inhibitor, are layed underground at depths of up to 1.5 m. There are 11 pumping stations located within the system (fitted with American equipment). The system can handle about 90 million tons of oil per year with future upgrade planned to increase it to 115 million tons per year.

Foreign experts consider this pipeline to be a significant geographic shortcut for supplying Saudi oil to the West and as a means to reduce the dependence of their export trade on shipping lines in the Persian Gulf.

An enormous industrial facility has been built in the Yanbu El Bahr area that has 11 oil storage tanks capable of holding up to 42,000 m^3. In addition, the Saudis intend to supplement this with underground tanks giving them a six million cubic meter oil sttorage capcity overall. The construction will be accomplished in stages. In the first phase (by 1987), piping will be layed from the oil source up to the site of the underground tunnel-type storage facility, and plans for the second phase (through 1990) are to complete its construction and outfitting.

A 1,168 km long gas pipeline (pipe diameter from 660.4 to 762 mm) has been layed parallel to the Abkayk-Yanbu El Bahar oil pipeline. It is designed to carryover 1,000 m^3 of liquified gas per day.

Other oil and gas pipelines link the major oil and gas fields to petroleum port facilities and shipping terminals in the Persian Gulf, as well as to oil refineries (see table).

KUWAIT's major petroleum industrial centers include Burgan, Vafra, Magva, Minagish, Redja, Raudatain, Sabiriya, Umm-Judeyr among others. Experts estimate that Kuwait's proven oil reserves, at the beginning of 1985, amounted to over 12 billion tons. Production in 1984 totaled over 57 million tons and 50 million tons in 1985. The leading oil refineries are considered to be Shuayba, Mina Al Ahmadi, Mina-Abd Allah, and Mina-Saud (with a total capacity of over 31 million tons per year).

Kuwait has a pipeline network for transporting oil, petroleum products and gas that covers over 460 km (Fig. 3). Two lines of pipe (762 and 914.4 mm diameter) run for about 248 km, from the Randation oil field and another line (558.8 to 660.4 mm diameter) runs for nearly 50 km from Minagish. They supply oil to the refinery and port facilities at Mina Al Ahmadi.

Six lines of pipe (406.4-914.4 mm diameter) carry oil 32 km from the refineries at Burgan, Vafra, and Magva to the port facilities in Mina Al Ahmadi, Mina-Abd Allah and Mina Saud.

Finished petroleum products are routed through a 16 km-long pipeline (508 mm diameter) from the Mina Al Ahmedi facility to a single sea port terminal. Part of this pipeline lies under water.

OIL AND GAS PIPELINES IN THE PERSIAN GULF REGION

Pipelines	Number of Lines	Length of Pipeline, km	Pipe Diameter, mm
Ain-Dar - Abkayk	2	90	508 - 711.2
Ain-Dar - Juaima	1	118	812.8 - 863.6
Abkayk - Al Quatif	6	402	508 - 1,219.2
Abakyr - Dakhran	2	127	304.8 - 355.6
Berri - Ras Tannurah	2	116	406.4 - 1,066.8
Juaima - Ras Tannurah	1	19	1,168.4 - 1,219.2
Kaysuma - Al Quatif	3	483	762 - 1,219.2
Al Quatif - Ras Tannurah	5	137	508 - 1,219.2
Al Quatif - Juaima	1	21	1,168.4 - 1,219.2
Saffaniyah - Kharsainiya	4	362	558.8 - 1,066.8
Usmaniya - Abakyk	6	541	355.6 - 1,219.2
Khurais - Ain-Dar	1	138	406.4 - 457.2
Kharsainiya - Ras Tannurah	4	357	558.8 - 1,066.8
Riyadh - Khurais	1	140	*
Saudi Arabia - Bahrain	2	84	304.8
Other Pipelines	*	228	*

Four lines of piping run from the refinery at Mina-Abd Allah to waterfront shipping terminals. These lines (with a pipe diameter of 304.8 to 609.6 mm) are over 16 km long. In addition, the Shuaiba refinery receives gas from a field in Burgan through a line of about 18 km in length.

BAHRAIN The country's proven oil reserves at the outset of 1985 totaled over 23 million tons and actual gas reserves were 205 billion m^3. More than 2 million tons of oil were produced in 1984. The primary oil fields are located in the Avali region. Bahrain has only one oil refinery rated at about 13 million tons per year. Most of its incoming crude oil comes from Saudi Arabia. These countries are linked by an oil pipeline consisting of two lines (pipe diameter 304.8 mm) (Fig. 4). It is about 84 km long with a capacity of 2.5 million tons per year.

QATAR is regarded as the chief oil producing country on the Persian Gulf. Its enormous oil and natural gas reserves are of such magnitude as to have global significance. Proven oil reserves in the mid 1980s totaled 460 million tons and natural gas reserves came to 920 billion m^3. Qatar's oil output in 1984 was estimated at 18 million tons and 14.5 million tons in 1985. The largest reserves have been found in the Dukhan region and on the continental shelf at Idd Al Sharqi, Maydan-Mahzan and Bul Hanine. Nearly all of Qatar's output is exported overseas. Two oil refineries are in operation at Umm-Said with an approximate capacity of over 2 million tons. Qatar's pipeline network runs for more than 500 km (Fig. 5).

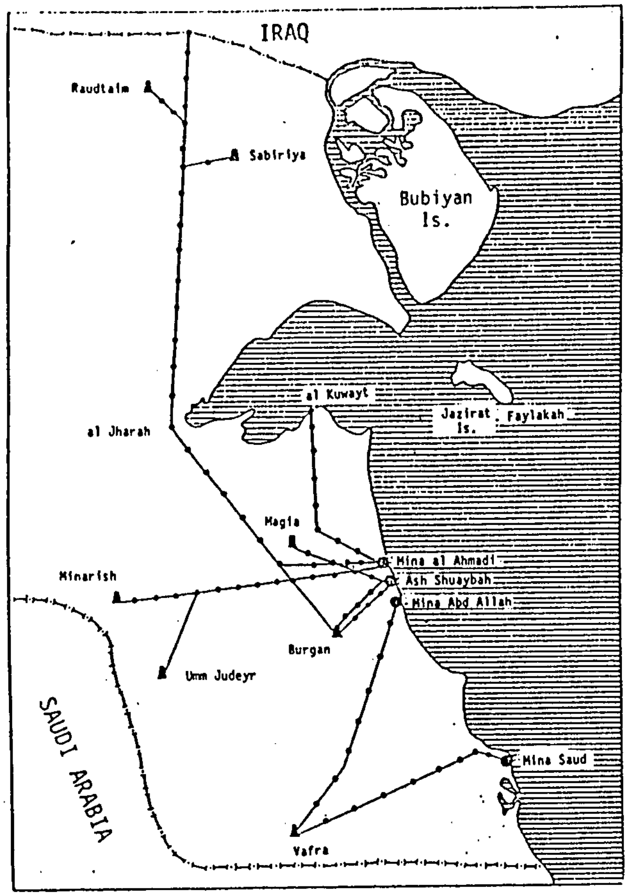


Figure 3. Location of Pipelines in Kuwait

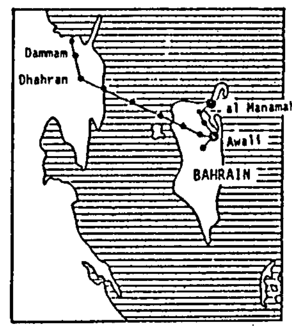


Figure 4. Diagram of Pipeline in Bahrain.

The oil extracted from offshore wells is sent through an underwater pipeline (pipe diameter from 304.8 to 508 mm)(to Umm Said and to Halul Island where there is a shipping terminal capable of handling tankers of up to 555,000 dwt.

Dukhan, located 96 km northwest of the capital city of Doha, is one of Qatar's fastest growing petrochemical industrial centers. A gas pipeline running from the petroleum facilities to the capital city provides gas as fuel for desalinization plants and electric power stations. Duhan is also linked to an oil shipping port facility in Umm Said by a dual oil pipeline (220 km long with a pipe diameter of 406.4 mm), where tankers of up to 300,000 dwt each can be accommodated. The port is equipped with over 16 storage tanks for crude oil.

The UNITED ARAB EMIRATES (UAE) consists of seven Emirates.

The UAE is well endowed with oil and natural gas. Its principal oil and gas bearing fields are located in the emirates of Abu Dhabi, Dubai, and to a much lesser extent in Sharjah and Ras Al Khaimah. The major fields in Abu Dhabi are ashore at Bu Hassa, Bab, Shamis and Asab, and offshore at Umm Ash Shaif and Al Zukum on the continental shelf. The main sources of oil in Dubai are at Fateh, Rashid and Falah. These are situated about 100 km offshore. Mubark is the greatest source of oil in the Emirate of Sharjah. The UAE's proven oil reserves at the outset of 1985. Besides oil, the UAE has considerable reserves of natural gas (914 billion m^3) with most of it in Abu Dhabi and Dubai. Annual gas production has reached 15 billion m^3.

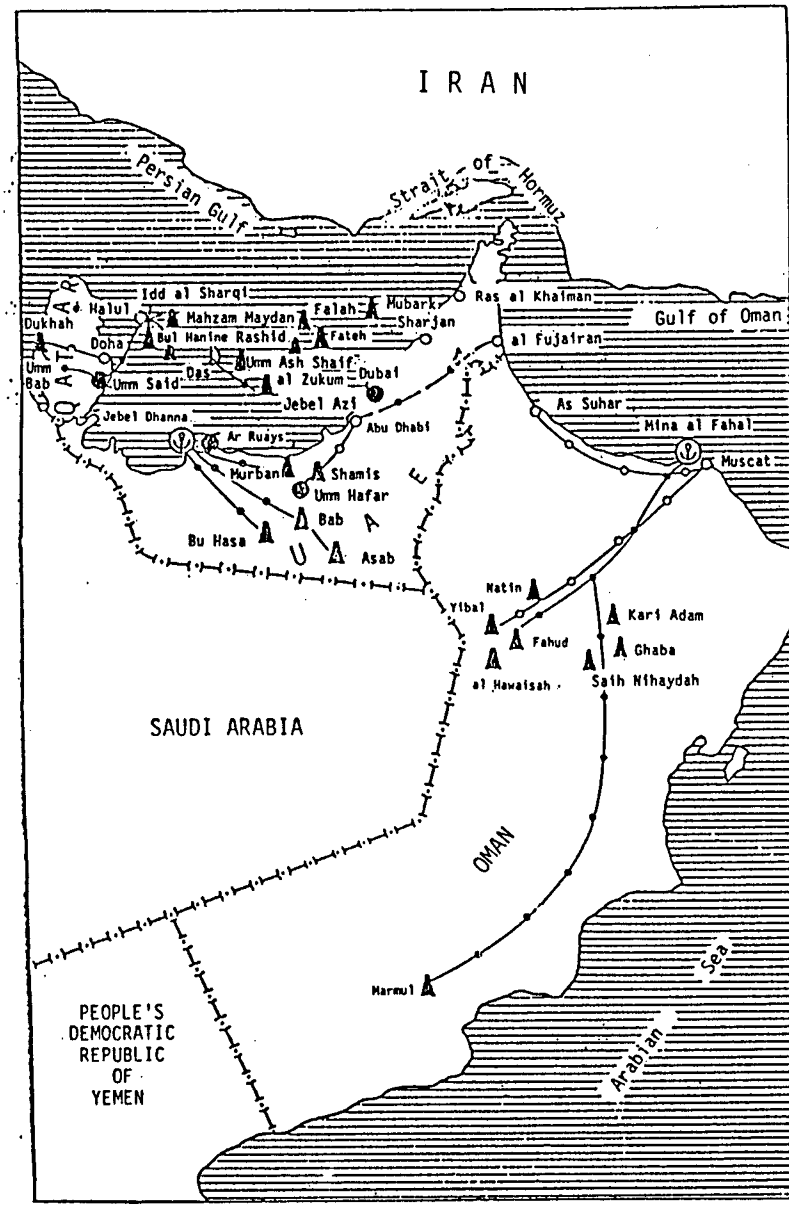


Figure 5. Location of Pipelines in Qatar, UAE, and Oman.

Three facilities have been built to refine their oil (total capacity is around 12 million tons of oil per year) at Umm Hafar, Jebel Azi, and Ruays, where a natural gas liquification plant is colocated (annual output capacity of 4.5

million tons). The UAE's leaders have devoted particular attention to developing oil and gas production on islands in the Persian Gulf. For example, there is a facility on Das Island for refining and liquifying by-product gas from Umm-Shaif along with a sea port terminal. This, in turn, required the development of an infrastructure of other elements.

The UAE has an intensive piping network that interconnects its petroleum industrial centers, refineries and ports. A 36-km long (457.2 mm diameter) pipeline has been laid from the Umm Ash Shaif and Al Zakum oil fields to Das Island. The port of Jebel-Dukhan receives oil from refineries at Asab, Bu Hasa and Murban through pipelines of 200, 70 and 90 km, respectively (pipe diameters range from 457.2 to 762 mm). There, it is loaded aboard tankers of up to 300,000 DWT and shipped out for export. Purified by-product gas from the fields as Bab and Shamis is supplied to the capital city of Abu Dhabi, where it is used as fuel.

For the future, the UAE plans to take steps toward ensuring the security of their oil shipments. Construction efforts are already underway, in part, to build an oil shipment port and military airfield in the Al Fujairah region where a naval detachment will be based to defend the petro-industrial facilities and the shipping lane through the Strait of Hormuz. Moreover, progress continues to be made on a pipeline running from Abu Dhabi to Al Fujairah. The UAE leadership believes that this will permit them to continue exporting oil in the event that the Strait of Hormuz is mined.

The potential oil reserves of the Sultanate of Oman are estimated at 480 million tons and their output in 1985 came to 23.5 million tons. Oman has several oil fields located in the region of Natin, Fahud, Yibal, Khuvaisakh, Ghaba, Kari Adam, Saih Nihaydah and others. Their petroleum refining industry is in its infancy. Construction was completed on a refinery in 1982, which had an annual design output capacity of about 2.5 million tons.

The major share of Oman's oil production comes from the field at Fahud which is linked to the port of Mina al Fahal by a dual pipeline. Mina al Fahal can accommodate tankers of up to 550,000 dwt. The pipeline is 500 km long (pipe diameter ranges from 762 to 914.4 mm) and has a design throughput of up to 20 million tons per year.

Marmul's oil is transported via a 445 km pipeline (pipe diameter, 457.2 mm) to a main line which connects Fahud to the port at Mina al Fahal. It can handle about 3 million tons of oil per year.

Oman's gas (1985 proven reserves amounted to 909 billion m^3) is transported via a gas pipeline, capable of carrying 3.54 million m^3 per day completed in 1978, which runs from Yibal to Muscat (345 km long and 508 mm in diameter). A 227-km long gas pipeline from Muscat to As Suhar opened at the end of 1981, and is apparently a continuation of the one from Yibal to Muscat.

A petrochemical industry has just been established in the Yemen Arabic Republic. The YAR is planning to build a 626-km long oil pipeline designed to carry oil from Salifa (on the Red Sea coast) to Sana (the capital city) and Taizz.

The country's oil pipeline construction programs being actively developed would allow a flexible oil export policy and would reduce the volume of their oil shipments through the Strait of Hormuz. They have made the decision to lay an oil pipeline from the eastern side of the Arabian Peninsula to the Red and Arabian seacoasts.

In September 1984, Saudi Arabia and Iraq came to a contractural agreement on construction of a new pipeline and for exporting Iraqi oil through the Saudi port of Yanbu el Bahr. Construction of the oil pipeline will be accomplished in two phases. In the first, plans are to build the northern portion from southern Iraq to join up with the Saudi's transnational "petroline." This part of the project, which can carry about 80,000 tons of oil per day, was placed in operation at the end of 1985. The western portion of the project constitutes the second phase. The overall oil pipeline capacity will reach 100 million tons per year. It is expected that the whole thing will become operational by the end of 1986. This new pipeline will be the second longest in Saudi Arabia.

At the same time, the leaders of the Arabian Peninsula countries are considering the idea of building a 1,500-km long Pan Arab oil pipeline to carry oil from the northern regions of the Persian Gulf through Saudi Arabia and beyond to the Arabian Sea coast.

The enormous oil and gas reserves, the development of their petroleum industry, construction of storage facilities for crude oil and refined petroleum products, and also the extensive pipeline networks and oil exportation ports, could all be used to support the U.S. Joint Central Military Command as well as by other countries who are members of the aggressive NATO bloc to furnish interventionist forces with POL. This fact, above all, lends great importance to the region.

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CSO: 1801/91

WEST GERMAN COMBAT VEHICLE WEASEL

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) p 75

[Article by Col E. Viktorov; "West German Combat Vehicle WEASEL"]

[Text] The tracked combat vehicle WEASEL was developed in the FRG in the mid-1970s, for the airborne assault forces. As reported in the Western press, army testing of four of the improved experimental models should begin this year. Unlike previous models, they have improved weapons and improved road capabilities. It achieves a maximum speed on the road of 85 km/hr. On two vehicles (which have the first variant of weapons) an armored turret, with a 25-mm automatic MAYZER cannon (together with a 20-mm REINMETAL cannon) is installed and, on the other two, the TOW anti-tank guided missile are installed which can be used also for firing the TOW-2 anti-tank guided missiles. Instead of the gasoline engine, a more dependable and economical turbocharged 86-hp diesel is used. The transmission and tracks and suspension durability have also been strengthened. The vehicle's hull is made of steel plates. The armor is designed to defend against bullets and artillery shell fragments.

The power unit is located on the left forward part of the hull. The engine and transmission (five-speed automatic) can be changed in 15 minutes. The vehicles normal turning circle is 7.2 m, but, by using the brakes, it can be reduced to 4.7 m. The guide wheels of the driving tracks are located forward. The road wheels have a torsion suspension. The vertical travel of the forward wheels is 170 mm, and 150 mm for the rear. A special mechanism automatically adjusts the track tension. The track links are wire-reinforced rubber.

The 80-liter fuel tank is made of reinforced fiberglass and installed in the after section of the vehicle. A foamy polyurethane sealer is installed to prevent an explosion when it is penetrated by a bullet. The infrared signature, generated when running the engine, is decrease by a muffler installed on the left side through which the exhaust gasses pass.

The combat weight of the WEASEL equipped with the TOW anti-tank missile is 2.6 tons, and with a 25-mm cannon, 3 tons; it has a 2-3 man crew; and a 200-km radius of action. The vehicle, which is 3.26 m long, 1.8 m wide and 1.9 m high is parachute droppable and transportable by helicopter using an external sling.

In the Bundeswehr command's estimate, the total requirement of the FRG airborne forces is about 345 WEASELs. In the event their tests are successfully completed in 1986, it is planned to introduce them into the forces from 1989 through 1992. To prepare for series production, 250 million West German marks have been earmarked. A self-propelled air defense battery and flame thrower, a command vehicle and an ambulance are also being developed on the basis of the WEASEL.

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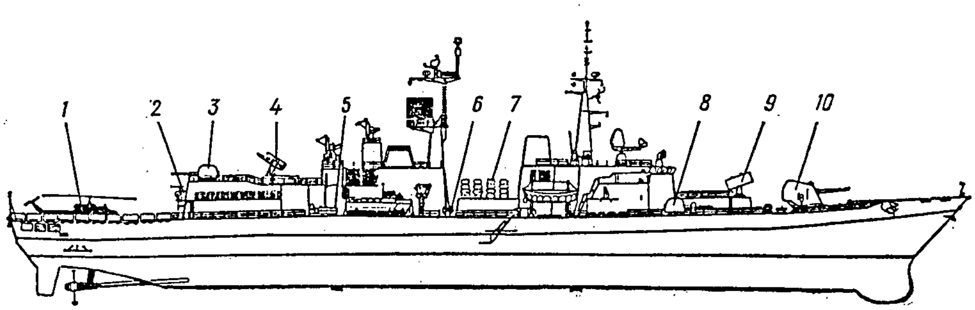
CSO: 1801/91

NEW ITALIAN GUIDED MISSILE DESTROYER

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) p 76

[Article by Capt 2nd Rank S. Vladimirov; "The New Italian Guided Missile Destroyer"]

[Text] In March 1986, in accordance with the Italian Navy's development program, the state company Finkanteri laid down two ANIMOSO-Class guided missile destroyers at the Riva Trigozo shipyard (in the city of Sestri-Levante). Earlier, in the foreign press, they had been referred to as the SUPER AUDACHE-Class (see figure). It is expected they will be commissioned in 1990.



Italian ANIMOSO-Class Guided Missile Destroyer

1. AB.212 helicopter; 2. Helicopter hanger; 3. 76-mm gun mount; 4. STANDARD air defense missile launcher; 5. 324-mm torpedo tube; 6. Chaff launcher; 7. MK2 OTOMAT anti-ship missile launcher; 8. 76-mm gun mount; 9. ASPID air defense missile launcher; 10. 127-mm gun mount.

The new ships, which have been designated the D560 ANIMOSO and D561 ARDIMENTOSO, are intended to replace the obsolete DDGS D570 IMPAVIDO and D571 INTREPIDO which were commissioned in the first half of the 1960s.

This type DDGs has the following design tactical characteristics: about 5,200-t displacement; length, 135.6 m; beam, 16 m; twin screw CODOG (two 27,500-hp LM2500 gas turbines and two 6,300-hp BL230DVM diesels) power plant; maximum speed, 31 kts; range at 15 kts, 7,000 mi; armament, four 2-container launchers for the MK2 OTOMAT anti-ship missile; a single STANDARD air defense missile launcher; an 8-round launcher for the ALBATROSS battery (ASPID air defense missile), one 127-mm and three 76-mm gun mounts; and two 324-mm three-tube torpedo nests. It is envisioned installing on the ship two AB.212 ASW helicopters (one in a hanger). There is a 400-man crew.

Radioelectronic equipment includes: AN/SPS-52C, MM/SPS-768, MM/SPS-774 air search radars; MM/SPS-702 surface search radar; AN/SPG-51D air defense fire control radar and four NA-30 gun mounts, MM/SPS-703 navigation radar, sonar with a keel-mounted DE-1164 array. It is also envisioned installing a SIGINT station, a setup for active jamming and two chaff launchers, equipped with anti-radar dipole reflectors and infrared absorbers.

The Italian command, as noted in the foreign press, is planning to use the ANIMOSO-Class DDGs as screens for the light aircraft carrier GIUSEPPE GARIBALDI.

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CSO: 1801/91

ENGLISH HAWK-200 AIRCRAFT

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 76-77

[Article by Col V. Ytkin; "The English HAWK-200 Aircraft"]

[Text] According to foreign press reports, a new light combat aircraft, the HAWK-200, has been developed in Great Britain. It is a single seat version of the two-place HAWK combat training aircraft. It differs from the basic model by the design of the forward part of the fuselage. The instructor's cabin has been eliminated and one or two ADEN 25-mm cannons and additional equipment have been installed in its place it in the nose section. An improved ADUR (modification MK871) ducted-fan turbojet engine has been installed in the HAWK-200 aircraft.

Flight tests of the aircraft began in May 1986. It is supposed to be used as a inceceptor against low-flying targets and as a ground attack aircraft for direct air support of ground forces, and also for aerial reconnaissance and in an anti-ship version. Hence, variations of armament will change. Specifically, on one under-the-fuselage and four under-the-wing suspension points it can carry in various versions air-to-air guided missiles, bombs, NAR, anti-ship missiles, other stores and also a suspended fuel tank and containers with reconnaissance and other equipment.

The make-up of its onboard navigation-piloting and sighting instruments, besides the standard set which the HAWK aircraft has, includes: a state-of-the-art inertial navigation system; equipment to reflect information on the windscreen; colored multifunctional indicators; a leading model radar or IR system (depending of the primary designation).

In British specialists' opinion, the tactical-technical characteristics (as shown) and the combat capabilities of the HAWK-200 aircraft, compared to the base model, has increased significantly.

Weight, kg	
Maximum take-off	9,100
Empty	4,130
Combat stores (maximum)	3,500
Maximum speed	
At high altitude, km/hr	1,040
When diving, Mach No.	1.2
Operational ceiling, m	15,240
Aircraft loading	from +8 to -4
Power plant	1 TRDD (maximum thrust 2,630 kg)
Fuel tank volume, l	
Total internal	1,750
Two under-fuselage	1,720
Single under-fuselage	590
Total	4,060
Ferrying range, km	3,600
Operational radius with combat stores,km	
2 SIDEWINDER and 2 external fuel tanks (at 9,000 m)	1,300
8 500 caliber bombs (at low altitude)	320
1 SEA EAGLE anti-ship missile and 2 external fuel tanks (at high altitude)	1,480
During a reconnaissance flight	945
Aircraft dimensions, m	
Length	11.3
Height	4.15
Wing span	9.39

It is noted also that to attract buyers from other countries, the British press is widely advertising the new aircraft. Therefore, the cited data can be overstated appreciably and calculated for ideal flight conditions without an estimation of the necessary correction and reserve.

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CSO: 1801/91

SWEDISH STOCKHOLM-CLASS PGM

Moscow ZARUBEZHNOYE VOYENNOYE OBOZRENIYE in Russian No 11, Nov 86 (signed to press 11 Nov 86) pp 77-78

[Article by Capt 1st Rank S. Morekhod; "The Swedish STOCKHOLM-Class PGM"]

[Text] In 1985, the missile boats STOCKHOLM K11 and MALME K12, built in the Karlskruna shipyard, entered service in the Swedish Fleet. In the foreign press, they are referred to as the SPIKA-Class because they are a further development of the SPIKA-2-Class boats. They have a displacement of 320 tons, a steel hull (length, 50 m; beam, 7.5 m; and a draft of 2 m), and an aluminum alloy superstructure. The boat has a CODAG-Type combined power plant (a 6,000 hp gas turbine and two 2,100 hp diesels). Maximum speed is 32 kts. Armament: six launchers for firing the RBS15 anti-ship missile, 57- and 40-mm guns, and two torpedo tube installations. There are guide rails for launching mines. It has a 30-man crew

The RBS15 anti-ship missile, made by SAAB (weight without booster is 598 kg; length, 435 cm; body diameter; 50 cm; wing span, 140 cm; maximum firing range, about 150 km; speed, M-1), uses a combined guidance system (inertial and active radar).

The BOFORS general-purpose Mk-2 single-barrel 57-mm gun mount is mounted on the bow (total weight, 6 tons; range, 14 km; rate of fire, 220 rds/min). The process for firing and reloading the magazine is completely automatic.

The BOFORS automatic single-barrel 40-mm gun mount is located on the stern and is intended for firing on surface and air targets (range, 12 km; rate of fire, 300 rds/min).

The two 533-mm torpedo tube installations are mounted on either side. They are adapted to fire the dual-purpose TP-427 torpedoes (length, 260 cm; diameter, 40 cm; weight, 298 kg).

The boat's radioelectronic equipment includes the PHILLIPS 9LV200 fire control system for firing the anti-ship missiles and the gun mounts; EWS 905 EW equipment with a FELIX chaff rocket launcher loaded with dipole reflectors or

IR absorbers; the TSM 2642 variable depth sonar made by the French firm TOMSON-CSF for submarine detection.

According to foreign press data, construction of four more of this class boat is planned for the Swedish Navy.

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